FOREST HEALTH AND THE UNITED STATES' FORESTS

SECTION 3

APPENDIXES

by the

Forest Health Science Panel

A Panel Chartered
by
Charles Taylor, Member
United States Congress

<u>Panel Members:</u>
Chad Oliver, Chair
David Adams, Thomas Bonnicksen, Jim Bowyer, Fred Cubbage, Neil Sampson, Scott Schlarbaum, Ross Whaley, and Harry Wiant
Congressional/USDA FS Liaison: John Sebelius

APPENDIX A: DEFINITIONS OF FOREST HEALTH

A desired state of forest health is a condition where biotic and abiotic influences on the forest (for example, pests,atmospheric deposition, silvicultural treatments, and harvesting practices) do not threaten resource management objectives now or in the future. (USFS current definition; from forest health strategic plan)

A condition wherein a forest has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and from retention of its ecological resiliency while meeting current and future needs of people for desired levels of values, uses, products, and services. (USFS pending replacement def.)

A desired state of forest health is a condition where biotic and abiotic influences on the forests (e.g. pests, atmospheric deposition, silvicultural treatments, and harvesting practices) do not threaten current or future resource management objectives of options. (The Role of “Salvage” Harvesting in the Restoration and Maintenance of Healthy Forests. Society of American Foresters position statement)

A forest condition that has overall structure, function, and characteristics that enable it to be resilient to disturbance and to maintain normal rates of change commensurate with its stage of development. (Soc. of Am. Foresters, Silviculture Terminology)

A condition of forest ecosystems that sustains their complexity while providing for human needs. (O’Laughlin, et al., In Assessing forest health in the Inland West, Sampson and Adams, eds.)

“Ecosystem health is an *idea* comprising a class of phenomena. It is a symbol for a complex set of ecological realities, rather than a condition that can be measured or monitored directly.” .. ” ...*health* describes the preferred state of sites modified by human activity.” (Steedman, Robert J. Ecosystem health as a management goal)

“Forests can be considered healthy when there is an appropriate balance between growth and mortality. Having the resilience to react and overcome various stressors is a key indicator o health,and is a key objective of ecosystem management.” (Soc. of Am. Foresters, Sustaining Long-Term Forest Health and Productivity)

“Health is the capacity of the land for self-renewal. “ (Leopold, 1949)

Forest health can be defined as the ability of a forest to recover from natural and human-caused stressors. (USDA Forest Service 1993, In O’Laughlin, Exploring the definitions of forest health, 1993).

Forest Health is a term defining the relative capacity of a forest to sustain values while maintaining integrity as a system, without human intervention. (Helms, John A. 1993).

APPENDIX B: FIGURES

CHARACTERISTICS OF FORESTS IN THE UNITED STATES

Unless otherwise stated, data is from Powell et al. 1993. Figures do not account for recent changes (e.g., Northwest Forest Plan of 1993).

APPENDIX B. FIGURES SHOWING FOREST CONDITIONS IN THE UNITED STATES.
Information from Powellet al. 1993. unless otherwise stated.
Information does not account for recent changes (e.g., Northwest Forest Plan and other changes.)

FIGURE B-1. CHANGES IN STAND STRUCTURES FOLLOWING DISTURBANCES.

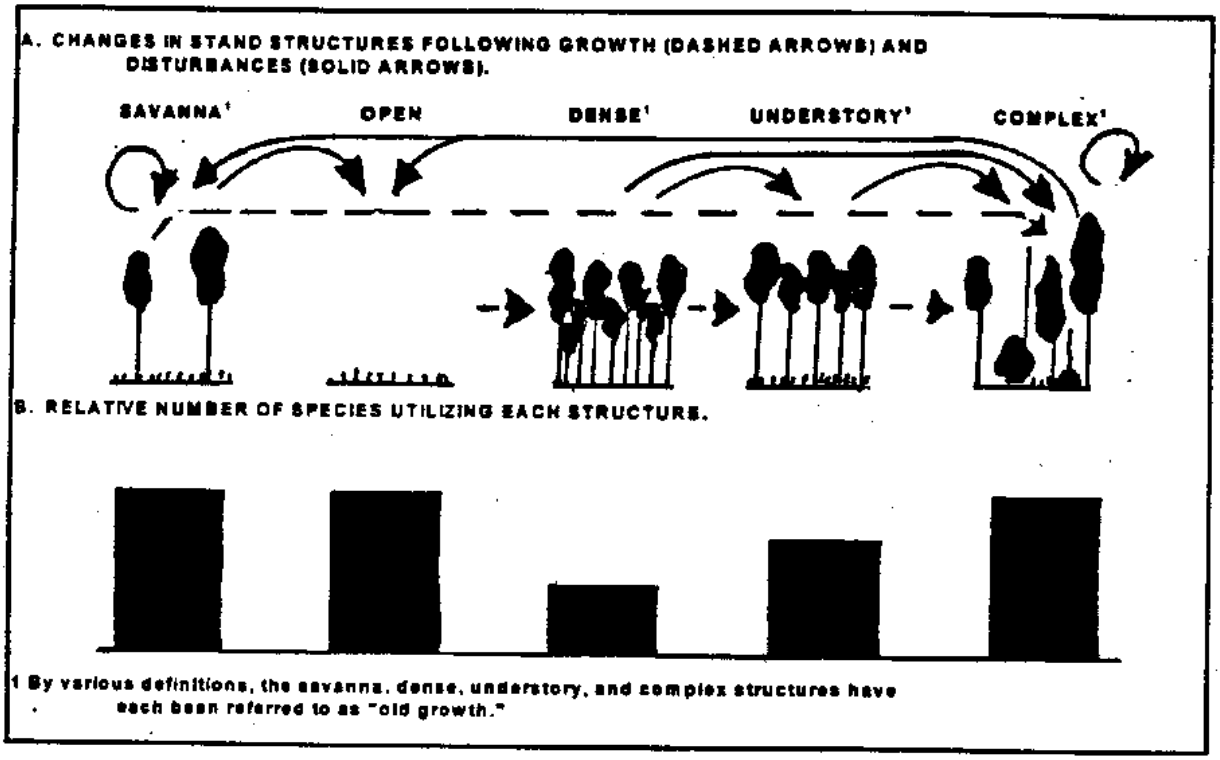


FIGURE B-2. REGIONS OF THE UNITED STATES REFERRED TO IN THIS PAPER.

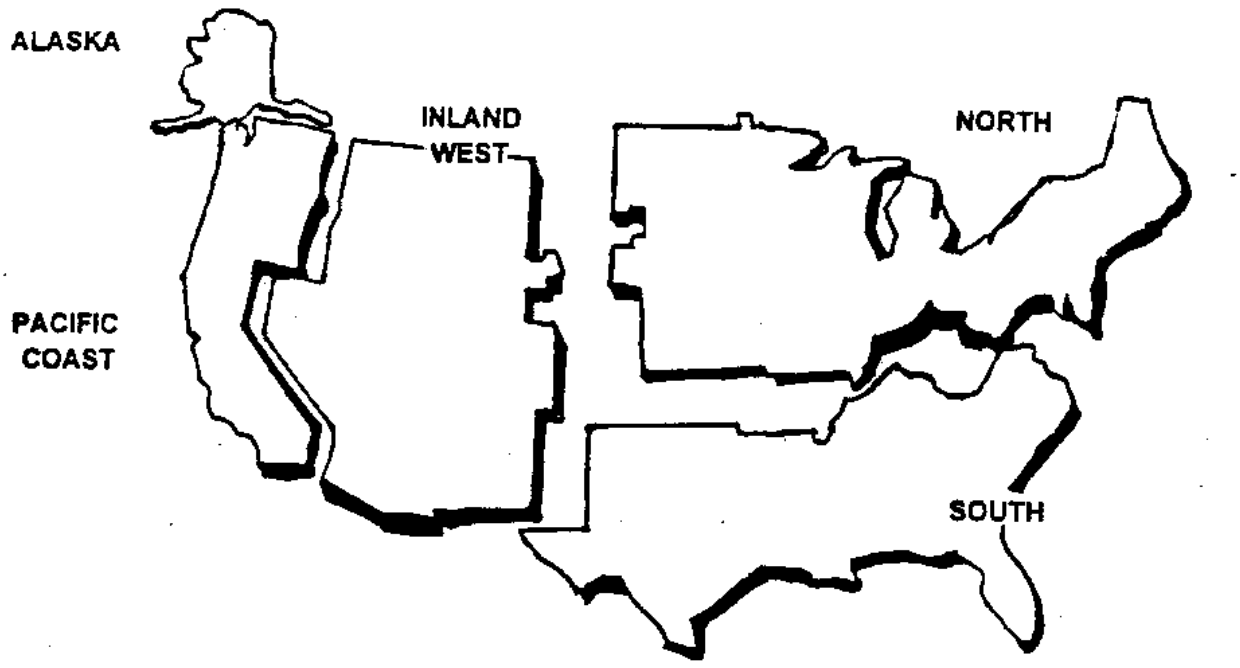


FIGURE B-3. CHANGES IN MORTALITY BY REGION & OWNERSHIP, 1952-1992.

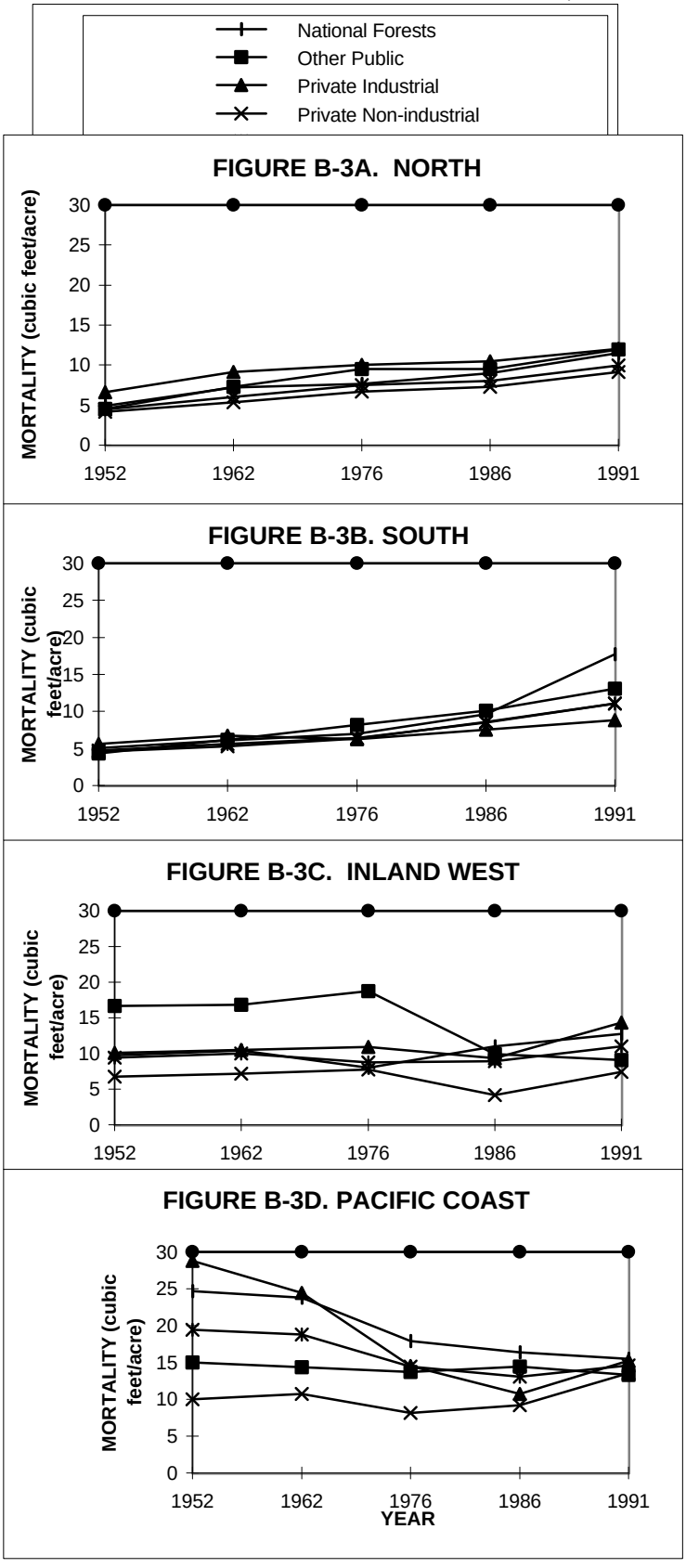


FIGURE B-4. VOLUME PER ACRE BY DIAMETER CLASS FOR DIFFERENT REGIONS, 1992.

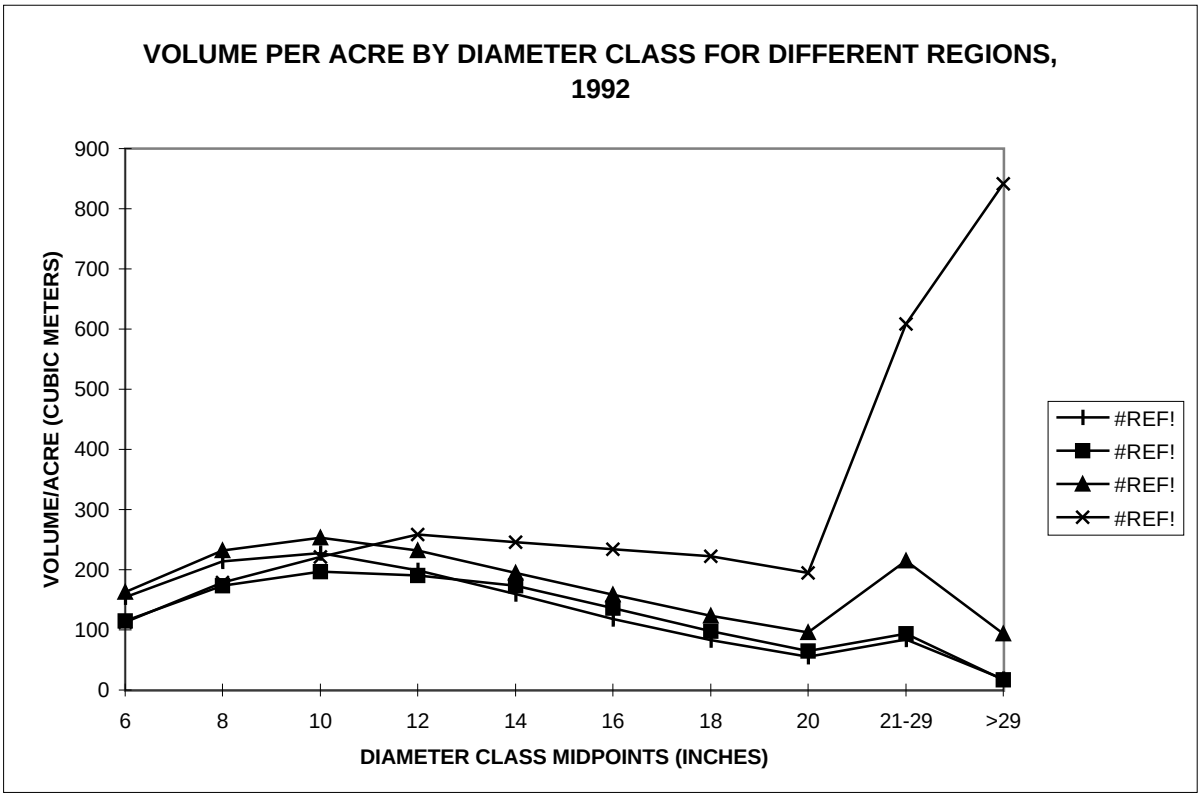


FIGURE B-5. CHANGES IN STANDING TREE VOLUME IN EACH REGION, 1952-1992.

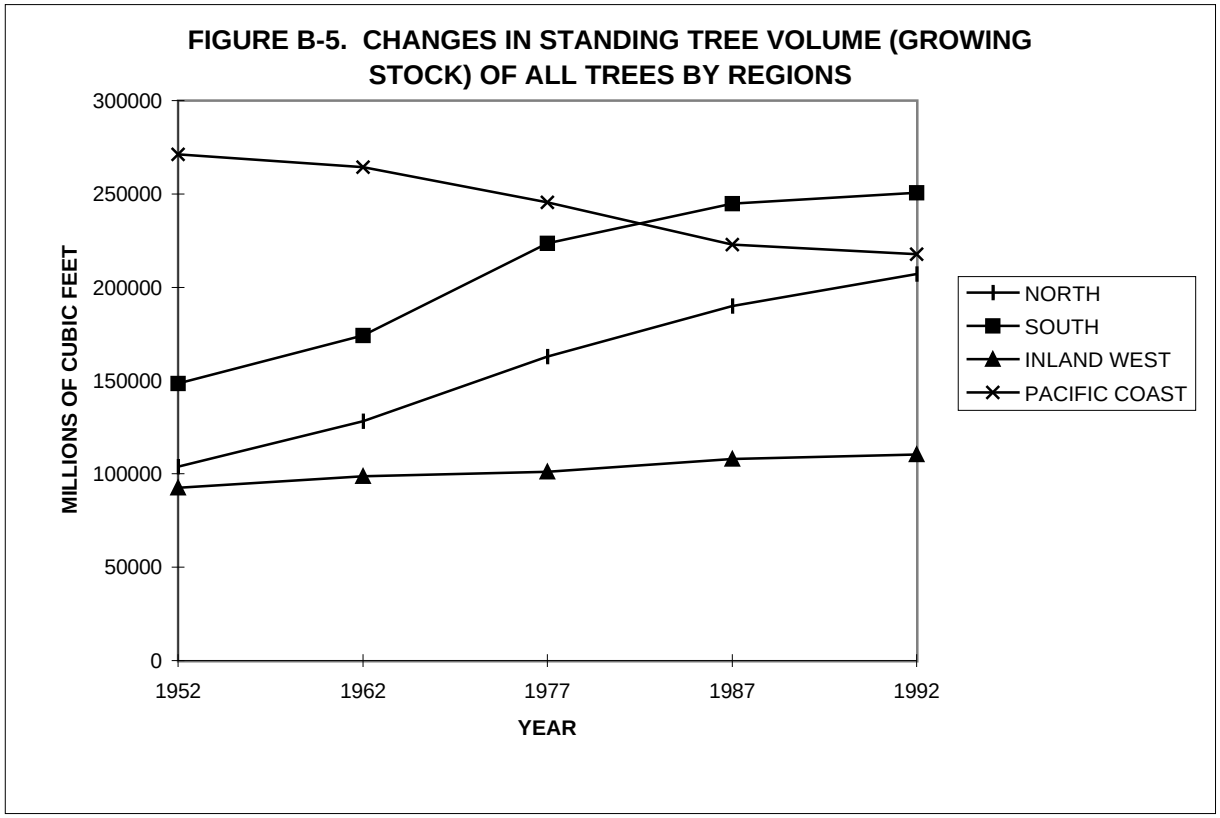
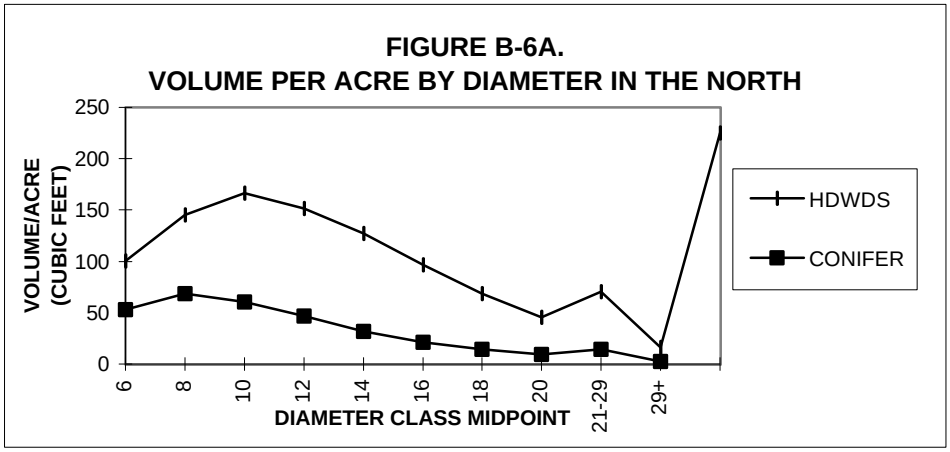
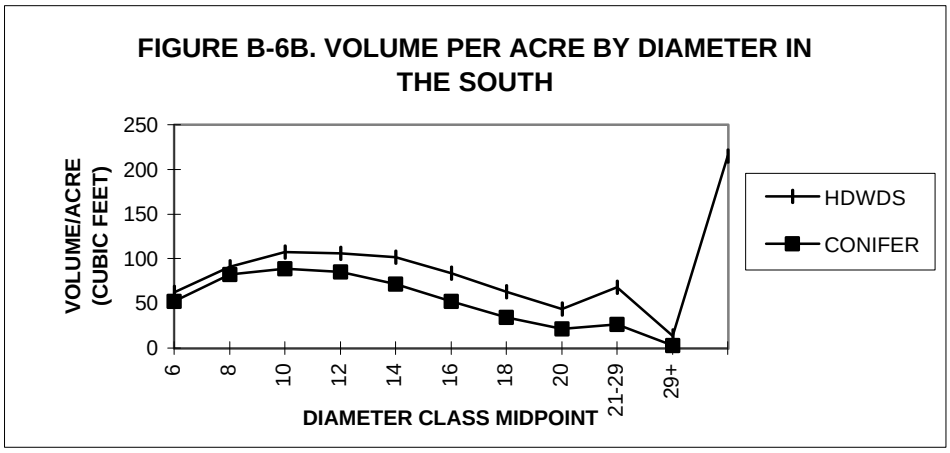


FIGURE B6. VOLUME BY DIAMETER CLASS, SPECIES GROUP, & REGION, 1991.





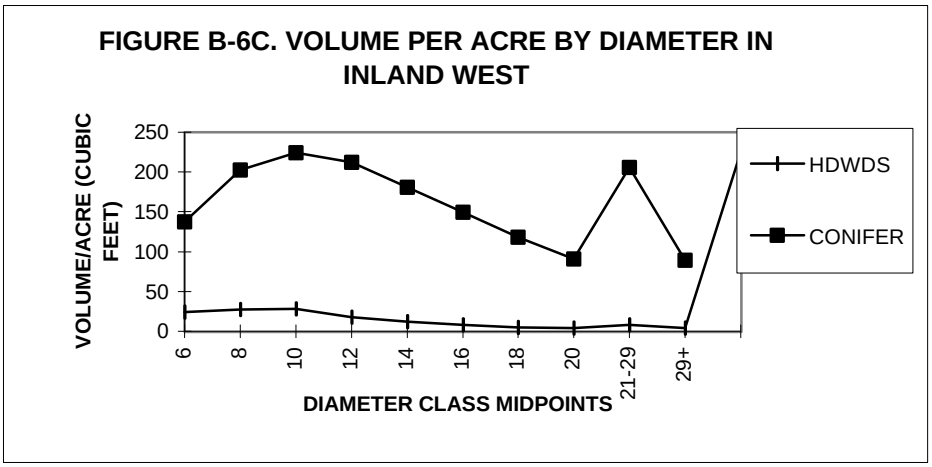
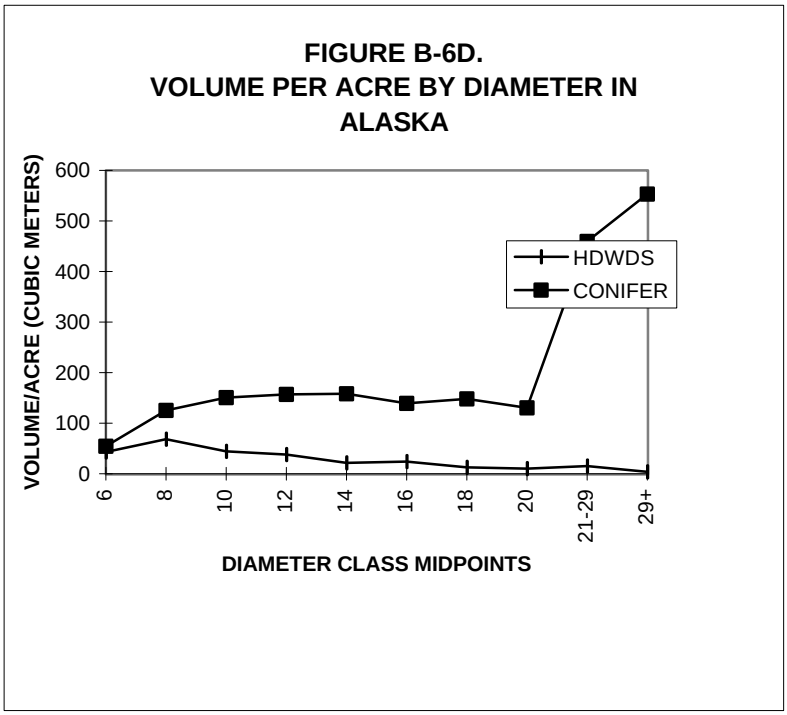


FIGURE B6 (CONTINUED) . VOLUME BY DIAMETER CLASS, SPECIES GROUP, & REGION, 1991.



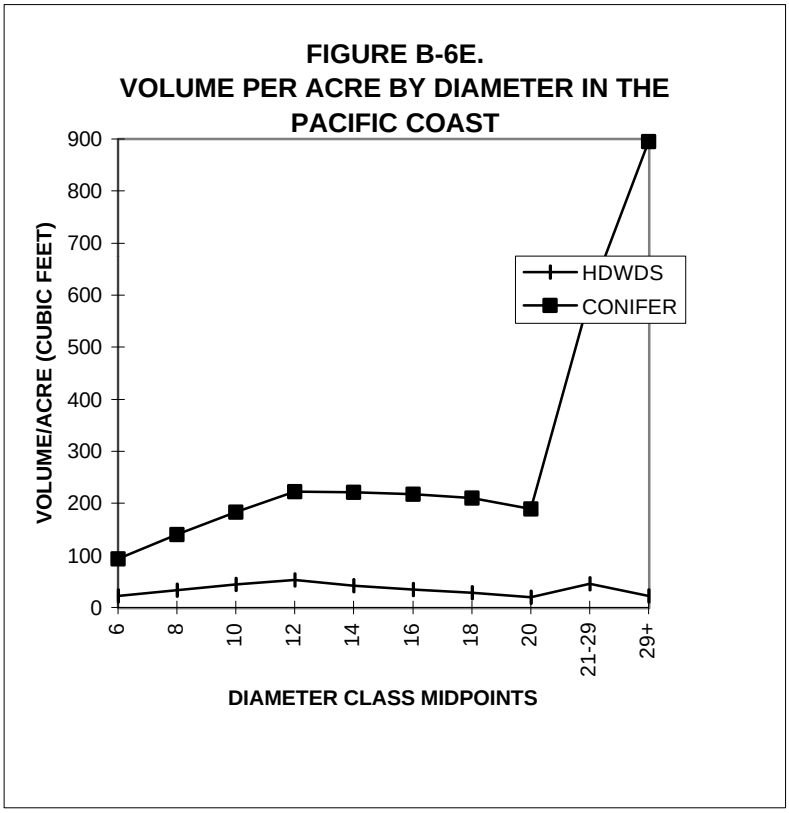
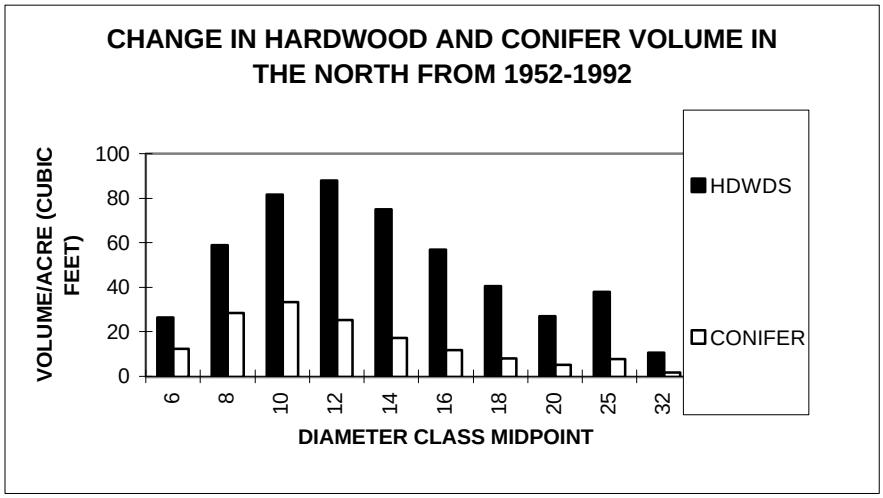
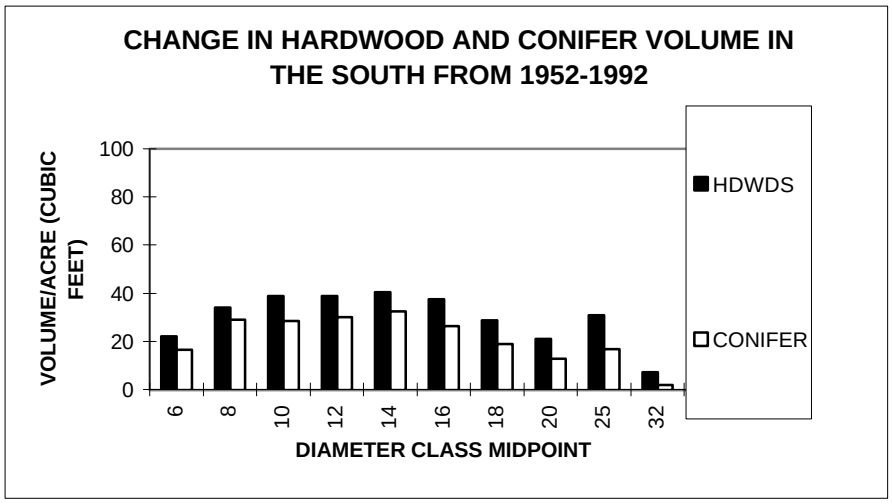


FIGURE B-7. CHANGES IN HARDWOOD AND CONIFER VOLUMES BY REGION, 1952-1992.





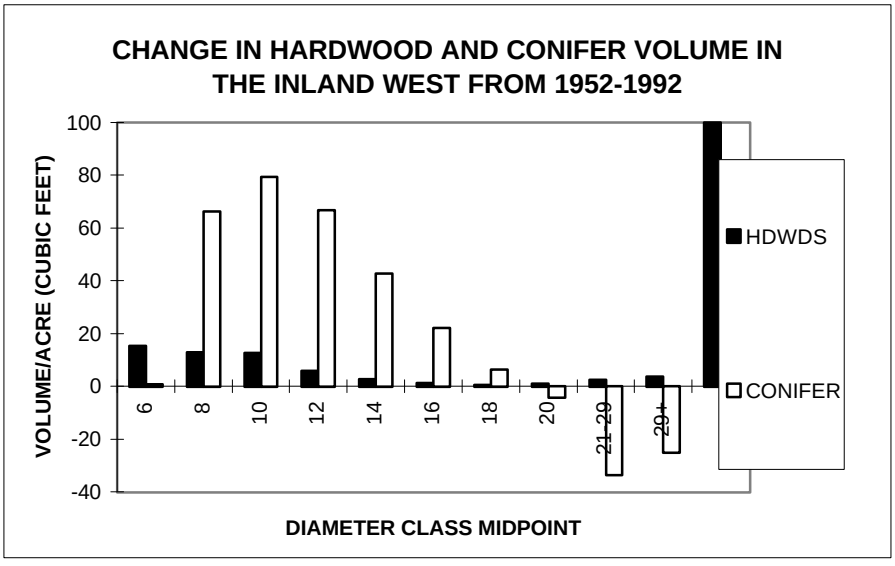
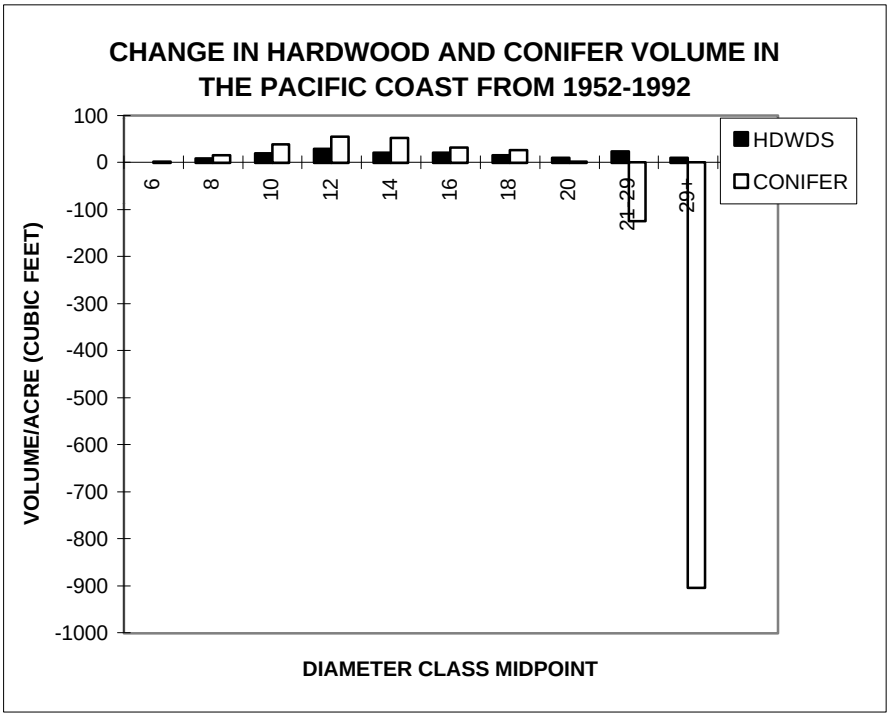


FIGURE B-7 (CONTINUED). CHANGES IN HARDWOOD AND CONIFER VOLUMES BY REGION, 1952-1992.



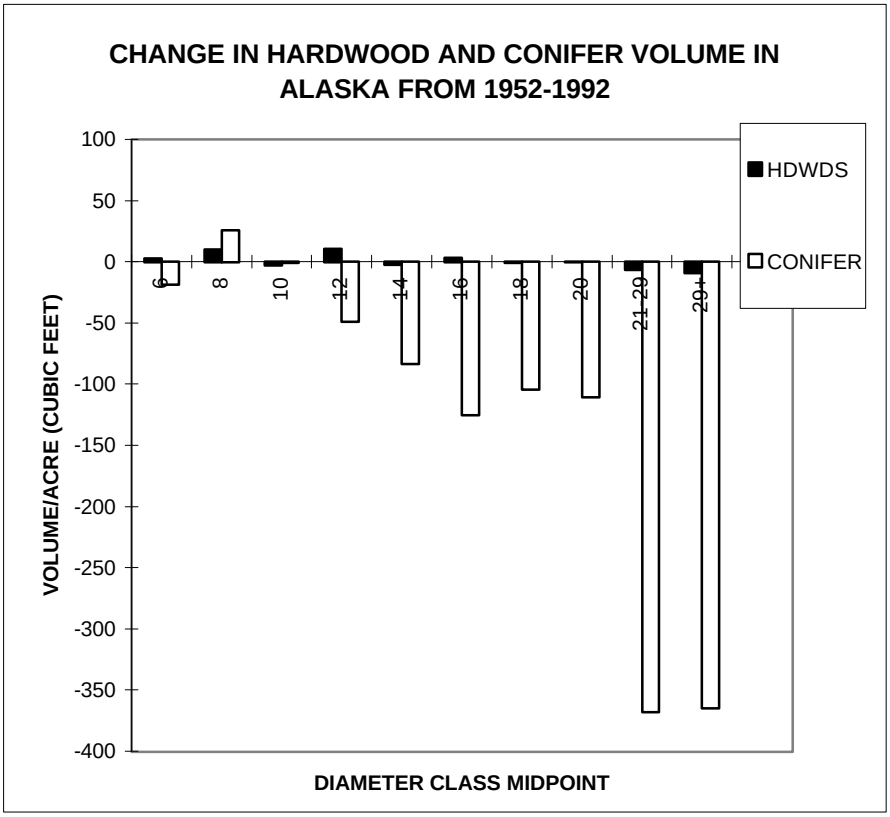


FIGURE B-8. CHANGES IN VOLUMES BY DIAMETER CLASSES BY REGIONS, 1952-1992.

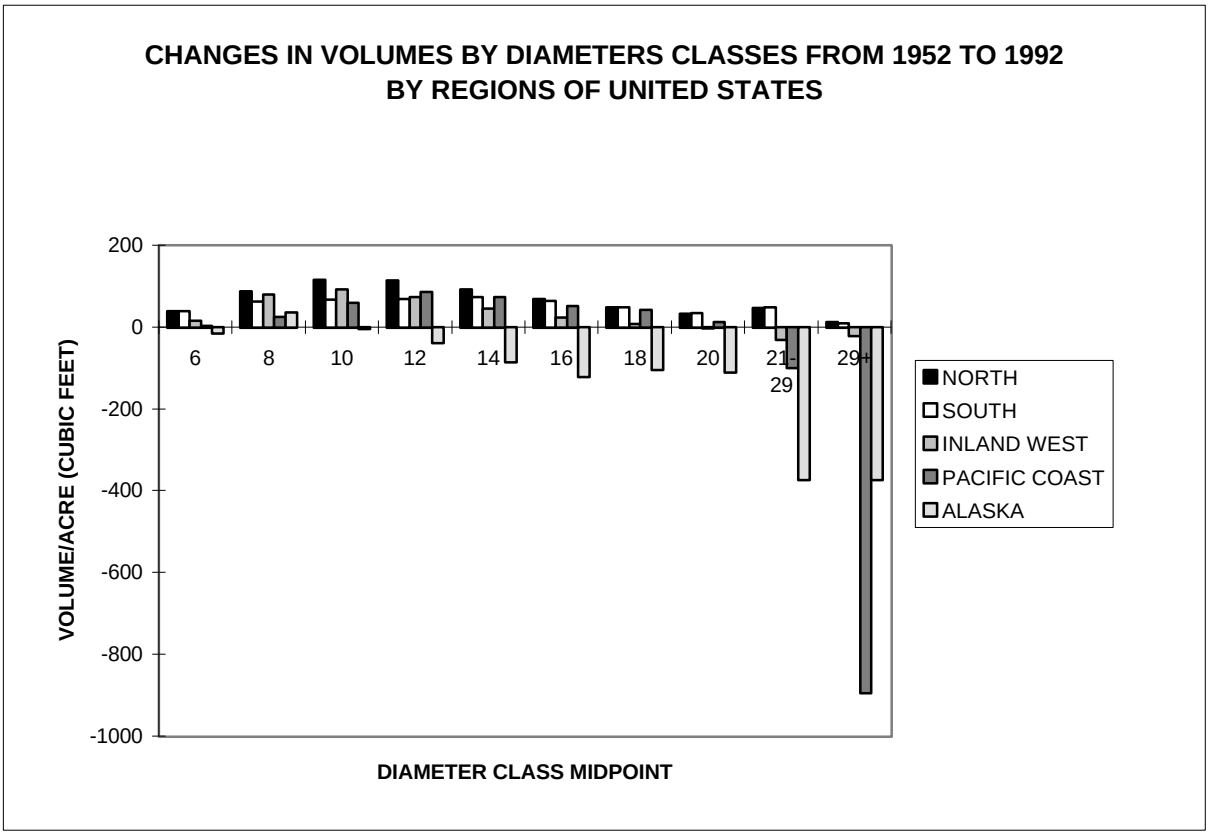


FIGURE B-9. CHANGES IN VOLUMES BY DIAMETER CLASSES AND REGIONS, 1987-1992.

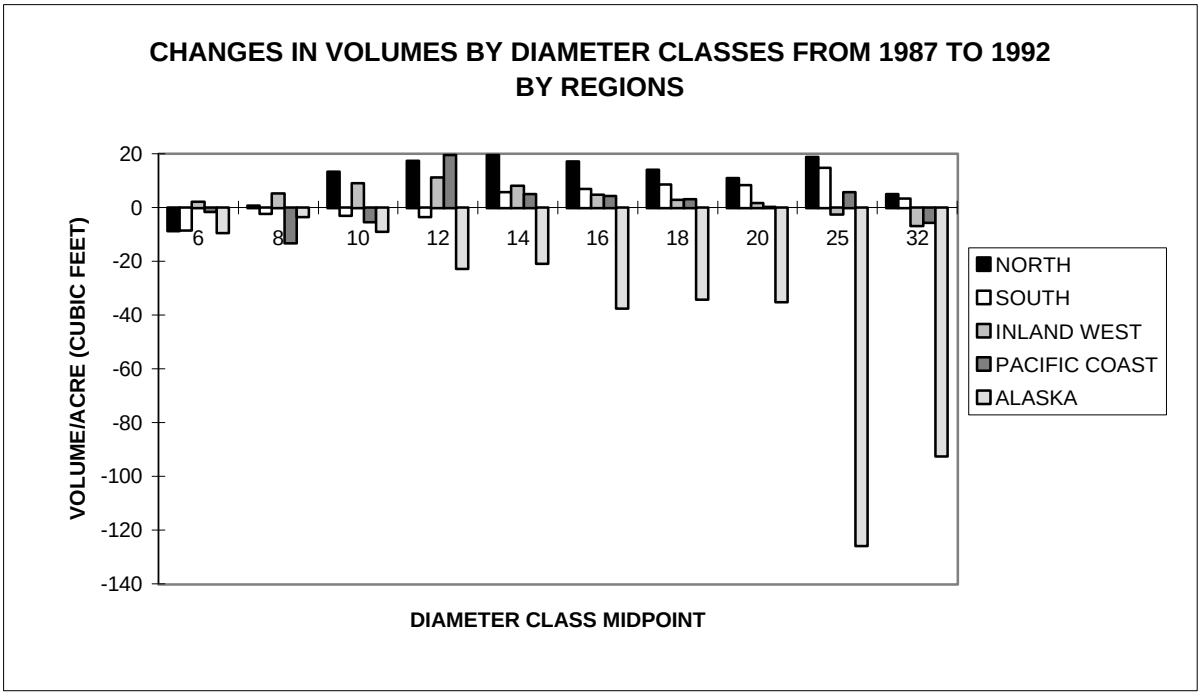
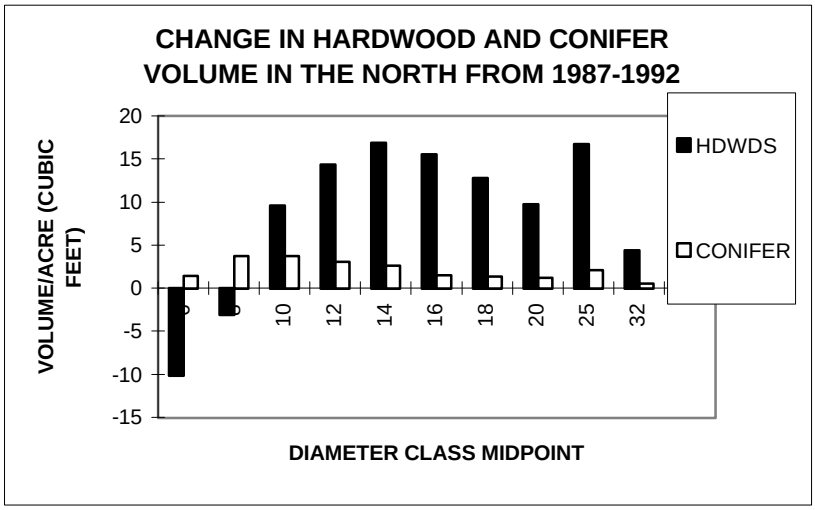
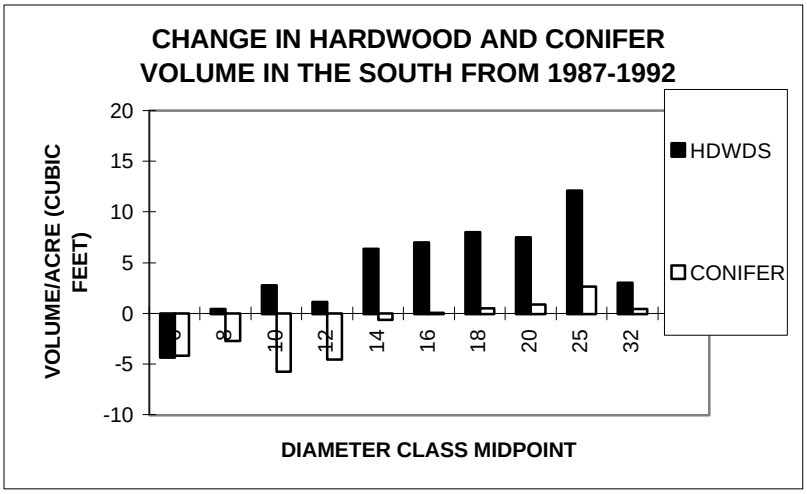


FIGURE B-10. CHANGES IN HARDWOOD AND CONIFER VOLUMES BY REGION, 1987-1992. NOTE CHANGE OF SCALE FROM FIGURE 7.





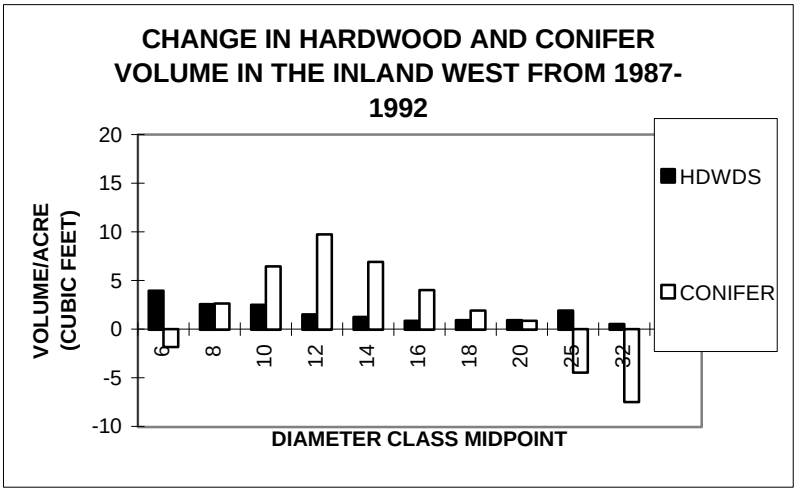
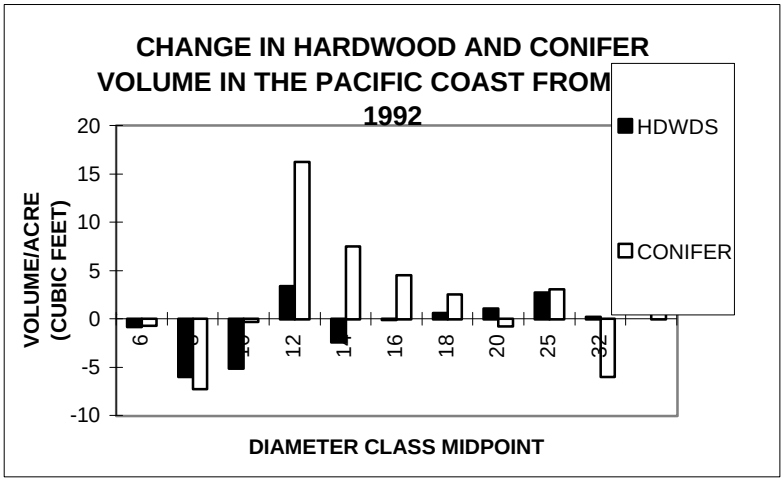


FIGURE B-10 (CONTINUED). CHANGES IN HARDWOOD AND CONIFER VOLUMES B
REGION, 1987-1992. NOTE CHANGE OF SCALE FROM FIGURE 7.



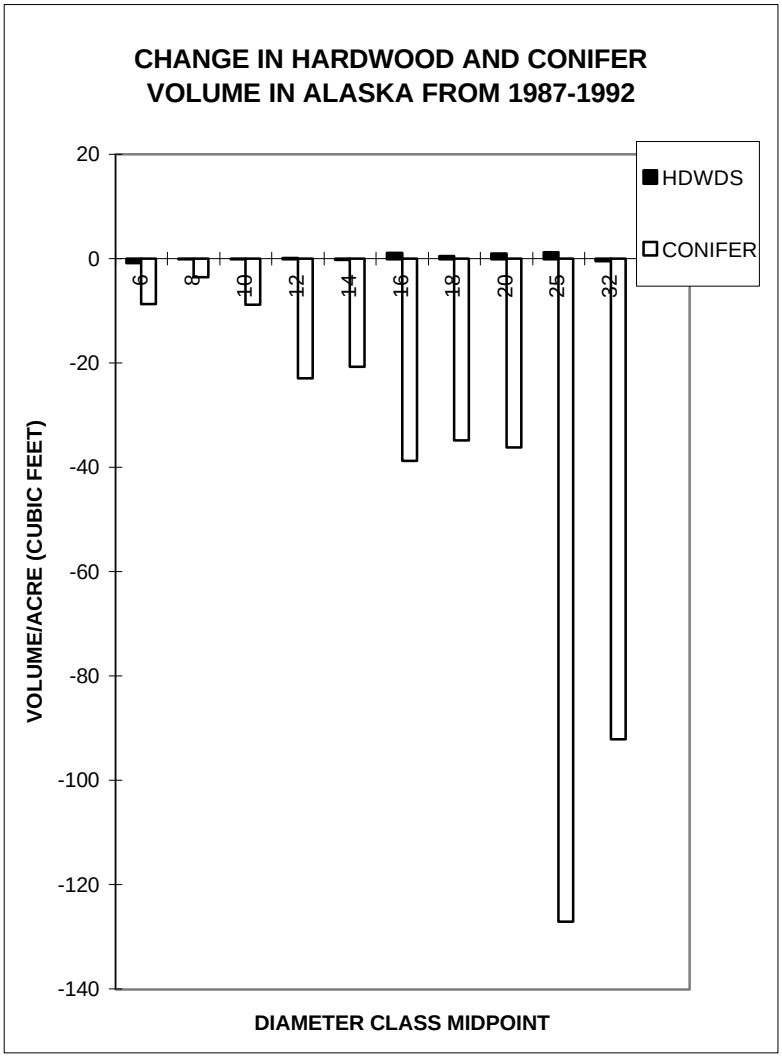


FIGURE B-11. AREAS BURNED ANNUALLY BY WILDFIRES IN THE WESTERN UNITED STATES (Data courtesy of R.N.Sampson, American Forests)

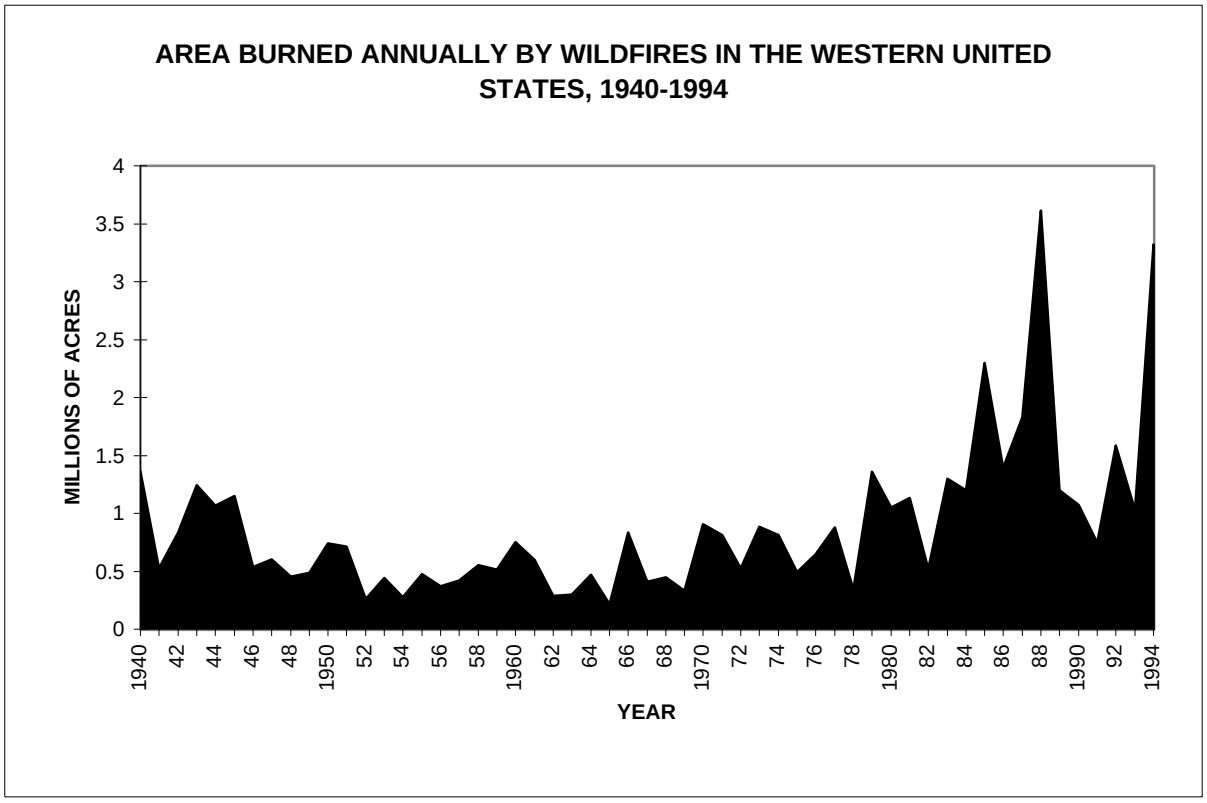


FIGURE B-12. RATE OF HARVEST AND MORTALITY COMPARED TO GROSS FOREST TREE GROWTH BY REGIONS. (SEE TABLE C-3 FOR NET GROWTH.),

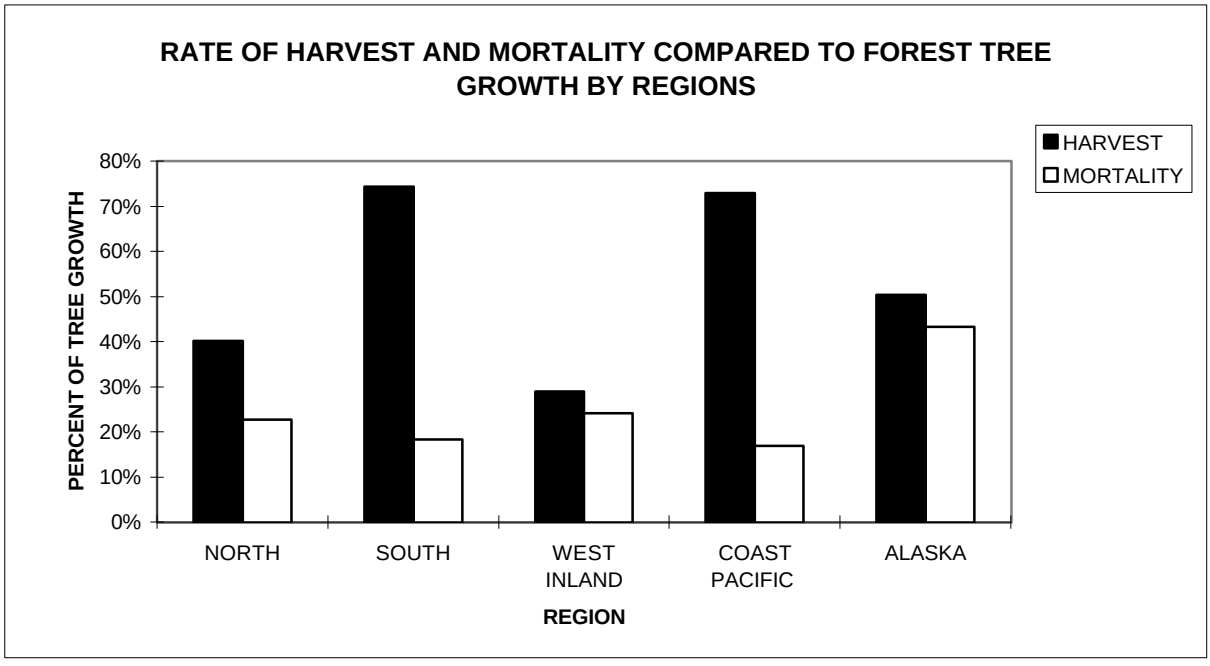


FIGURE B-13. STANDING TREE VOLUME BY TREE CONDITION AND SPECIES GROUP.

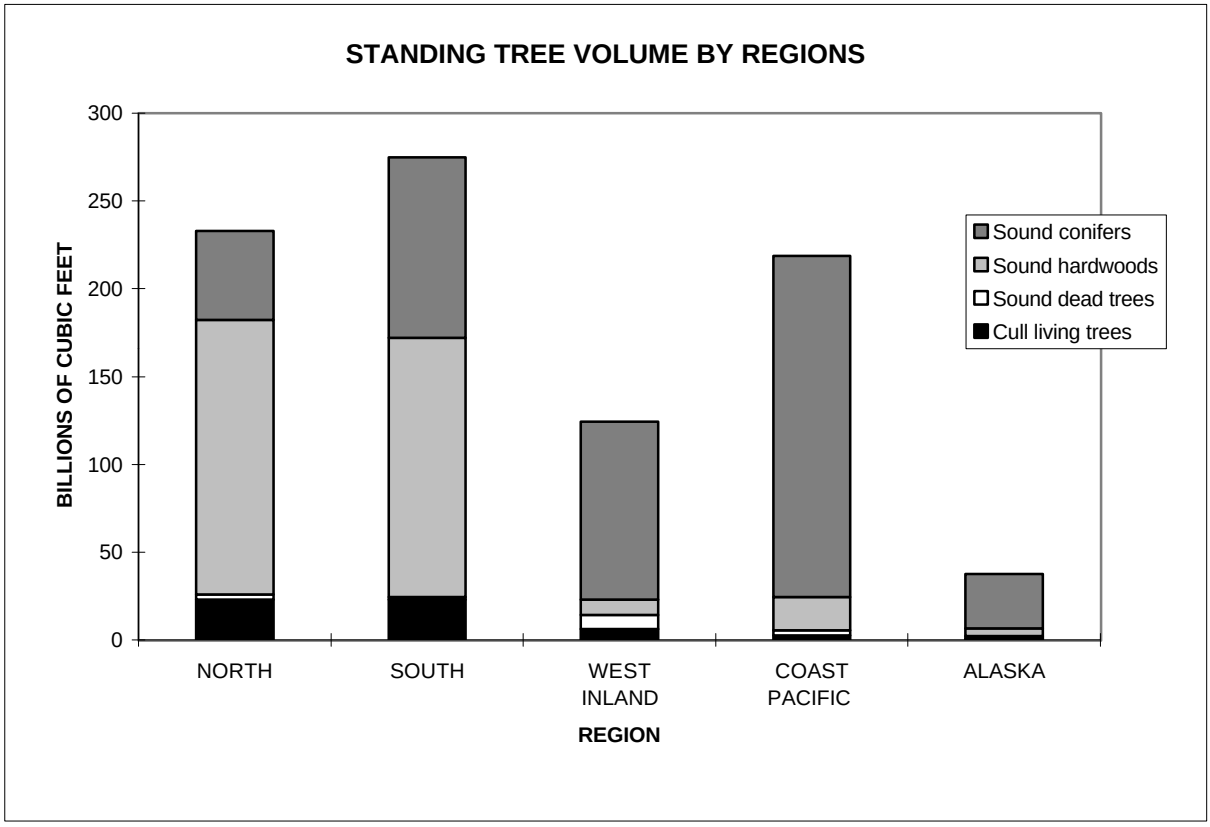


FIGURE B-14. FOREST AREA CHANGE, 1952, 1992.

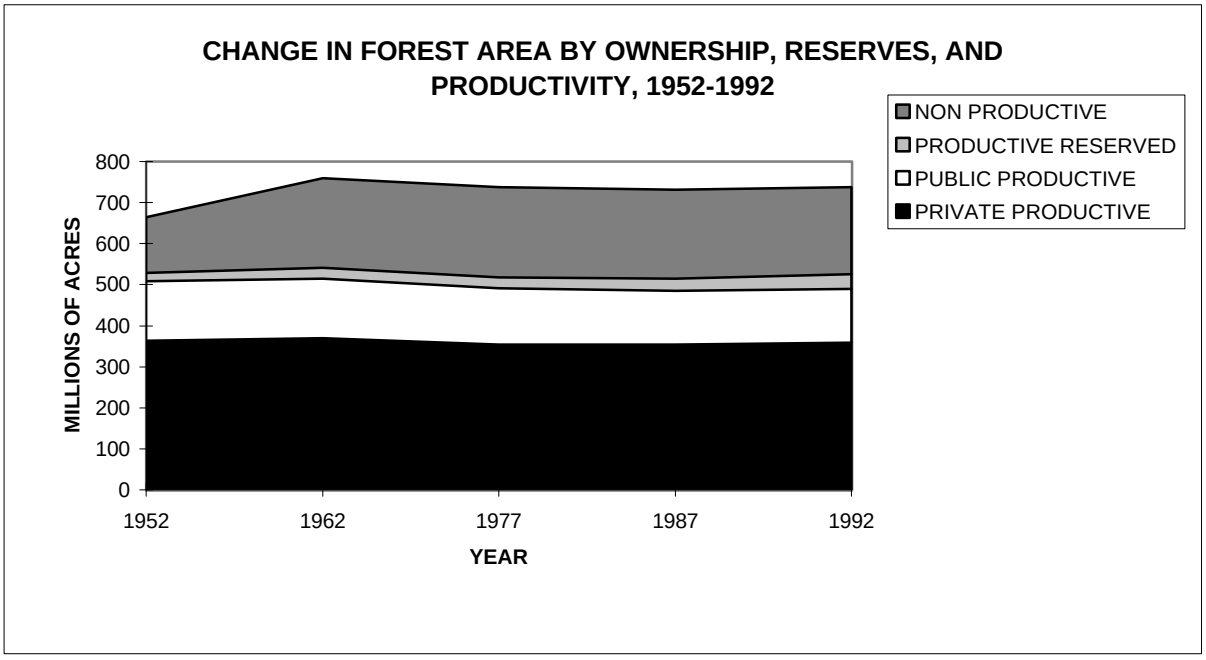


FIGURE B-15. CHANGES IN VOLUME FOR SELECTED SPECIES BY REGION, 1962-1992.

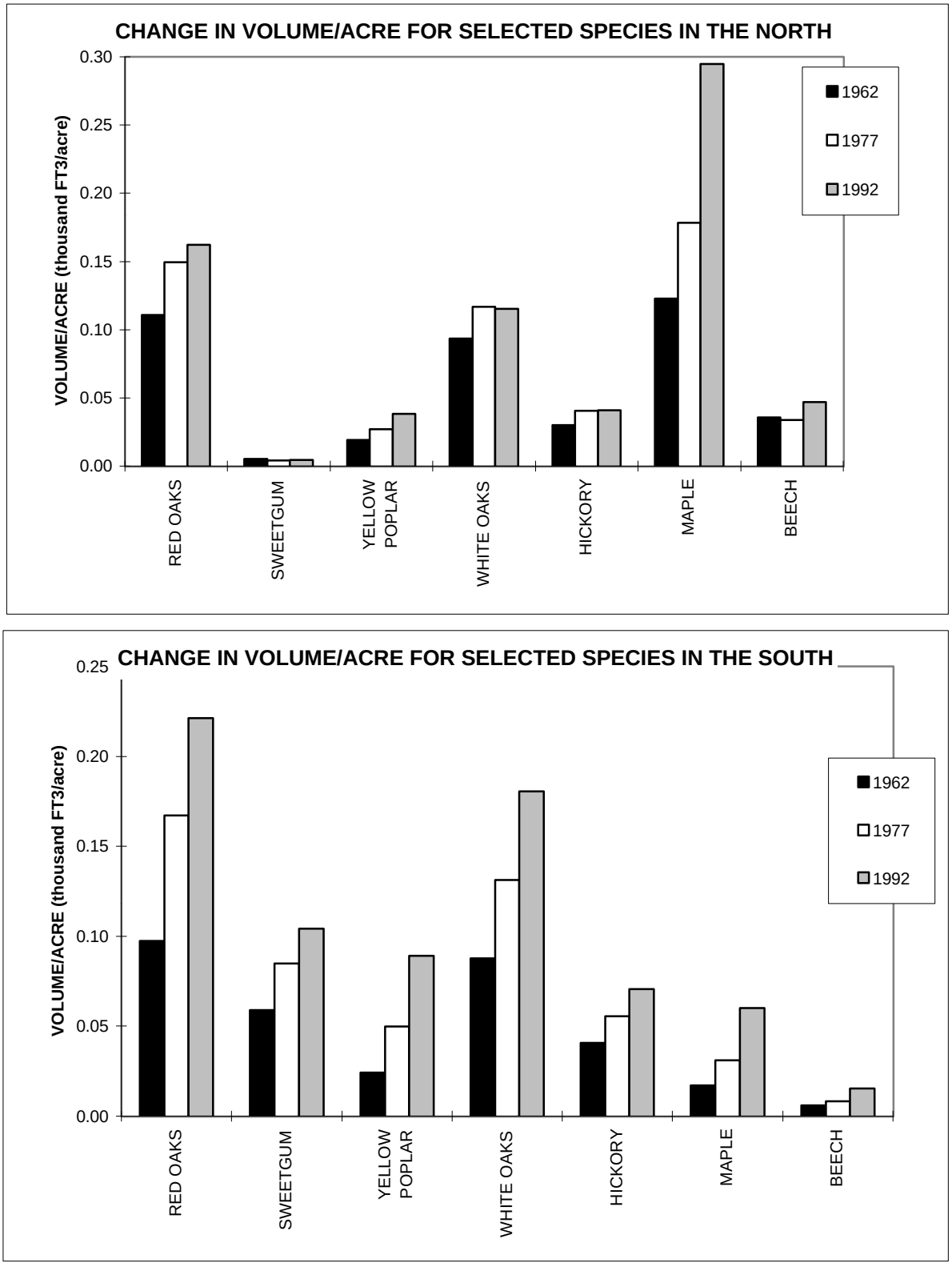
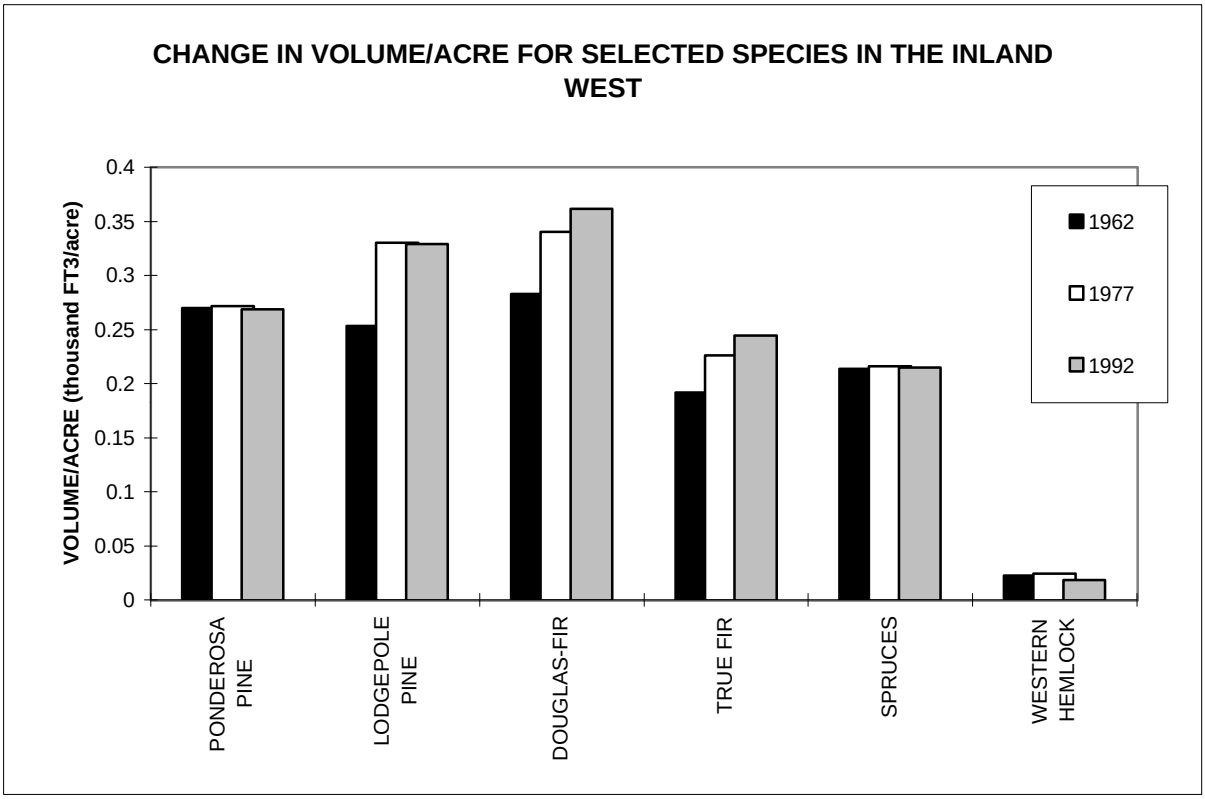


FIGURE B-15 (CONTINUED). CHANGES IN VOLUME FOR SELECTED SPECIES BY REGION, 1962-1992.



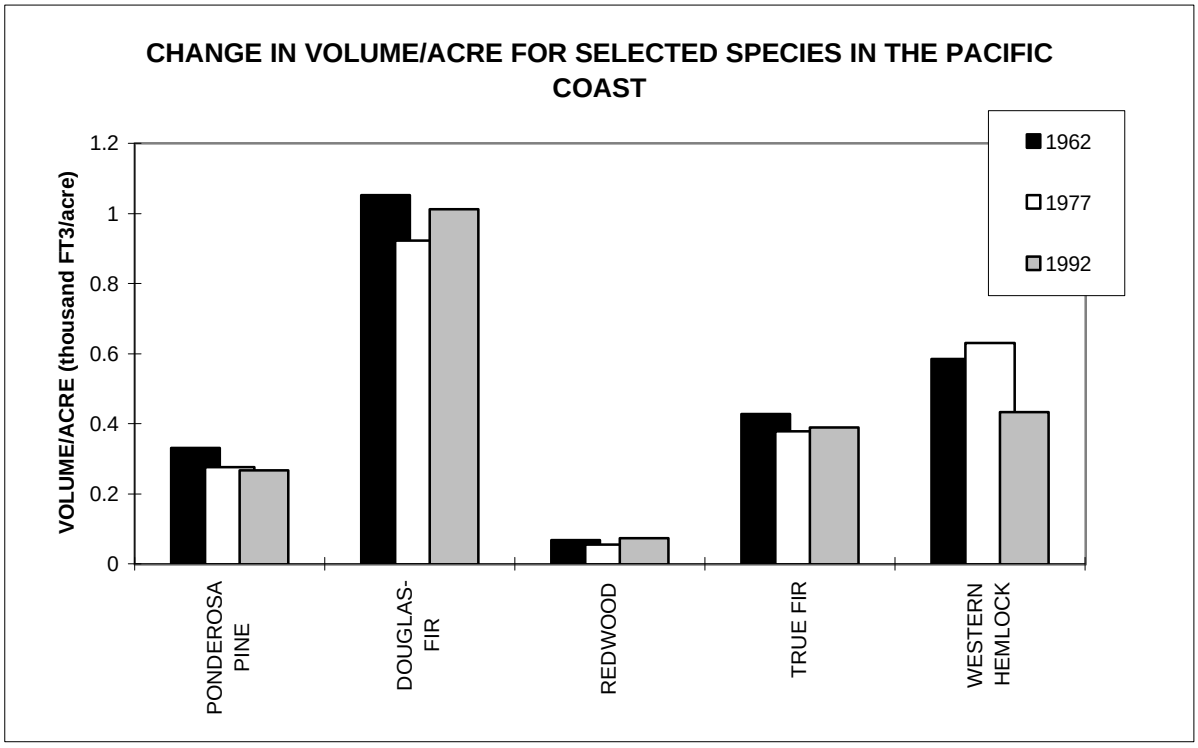
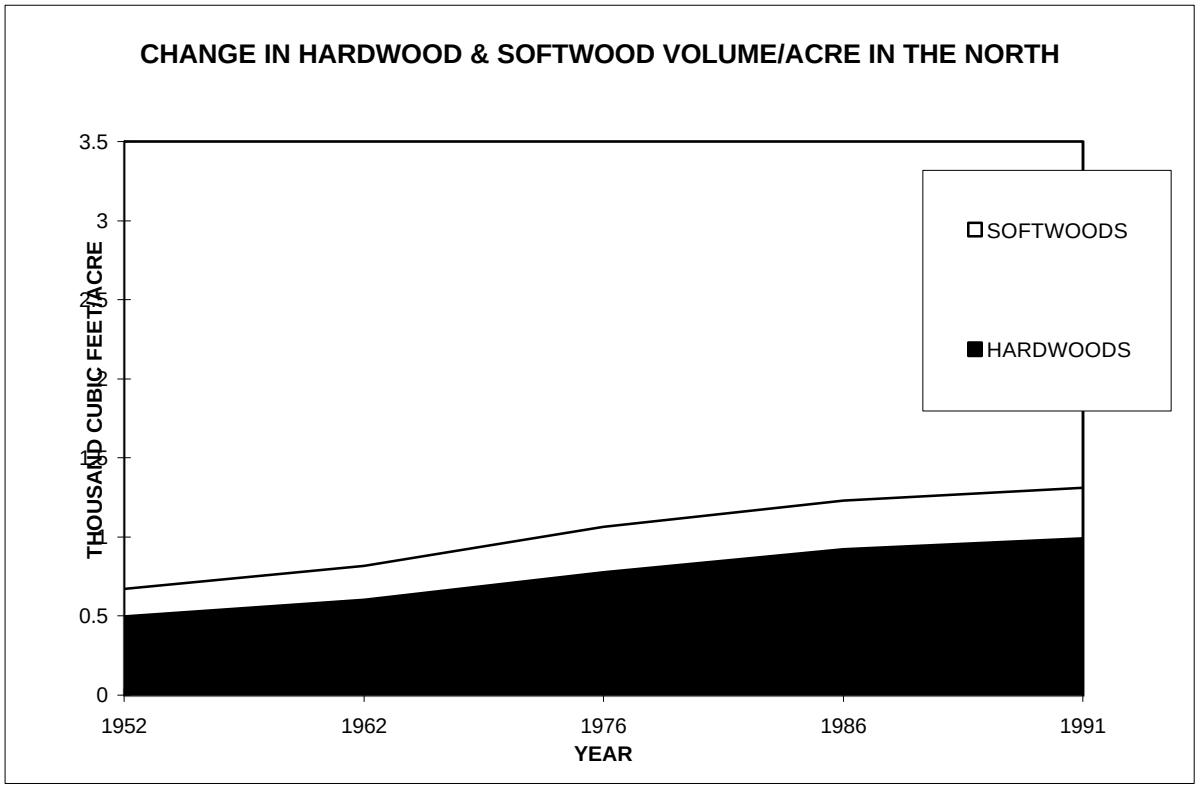


FIGURE B-16. CHANGES IN HARDWOODS & CONIFERS BY REGIONS, 1952-1992.



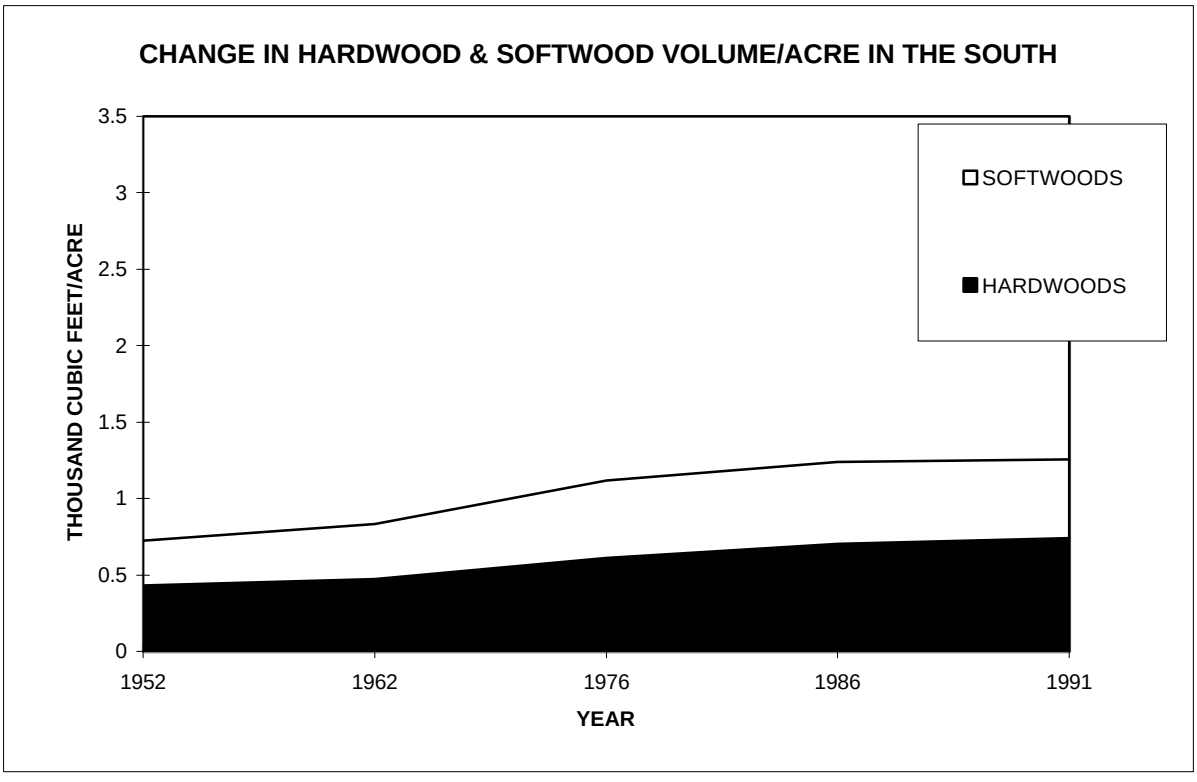
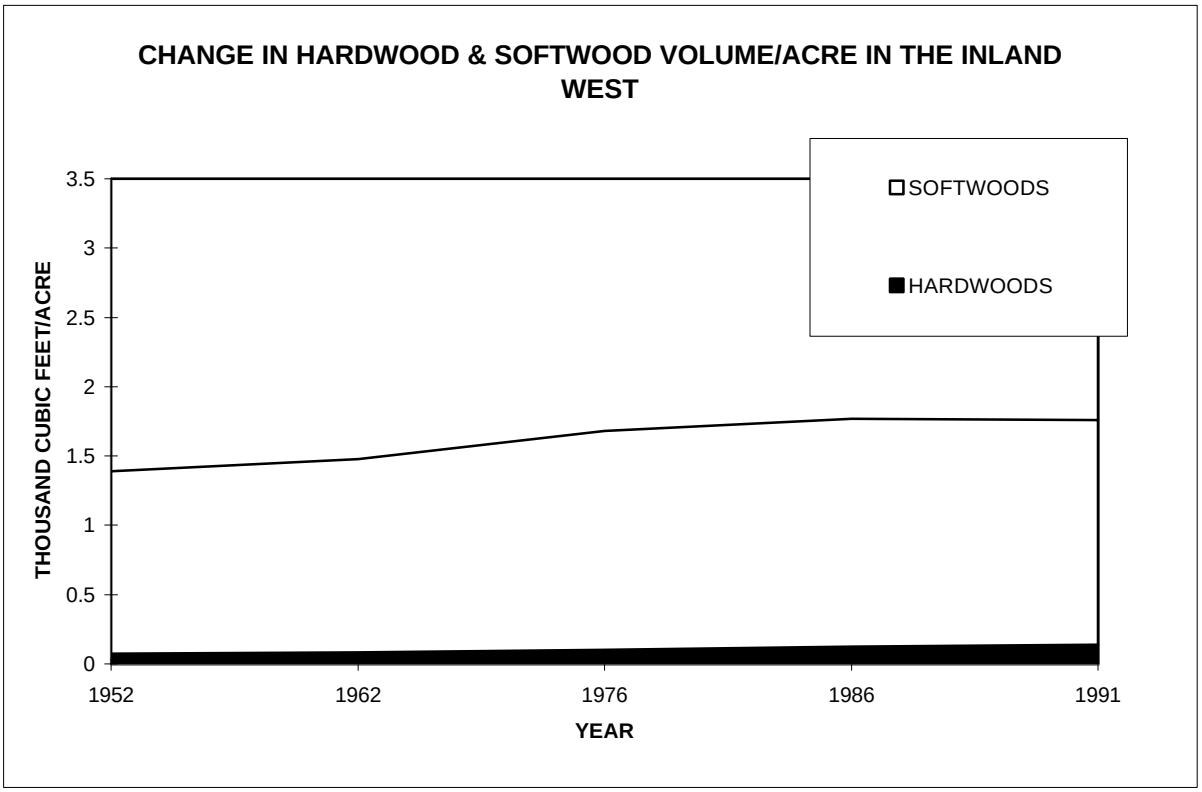


FIGURE B-16 (CONTINUED). CHANGES IN HARDWOODS & CONIFERS BY REGIONS, 1952-1992.



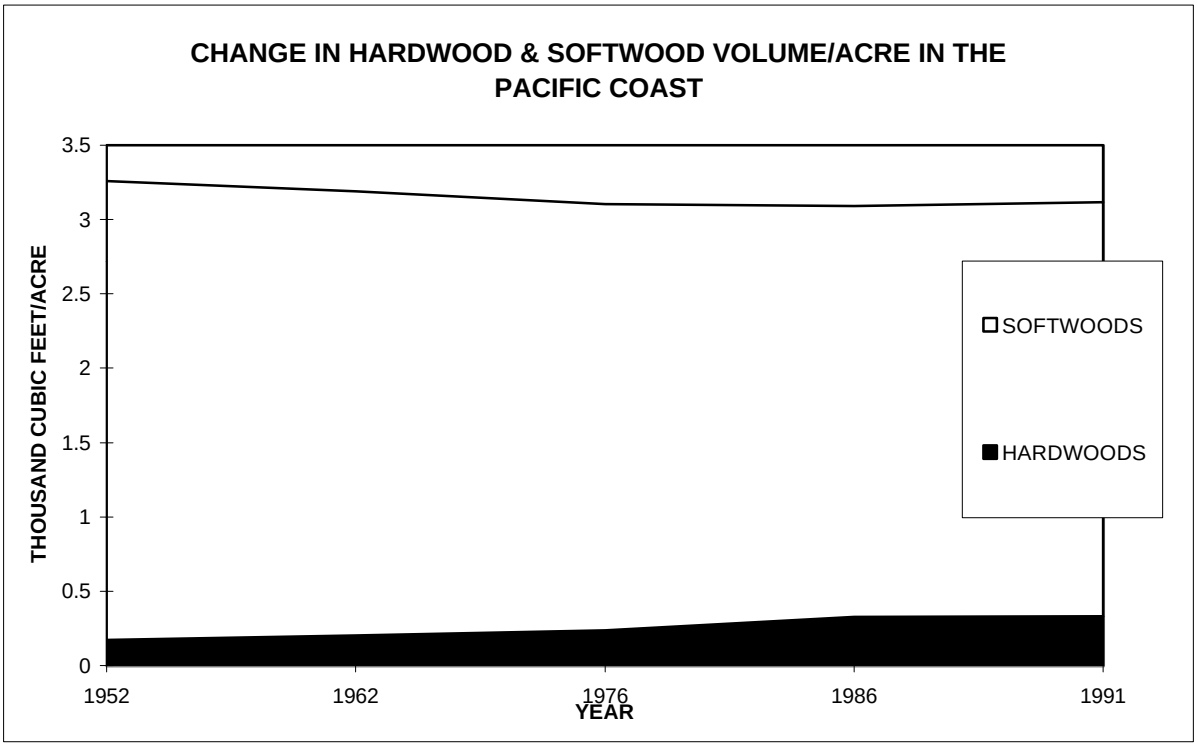
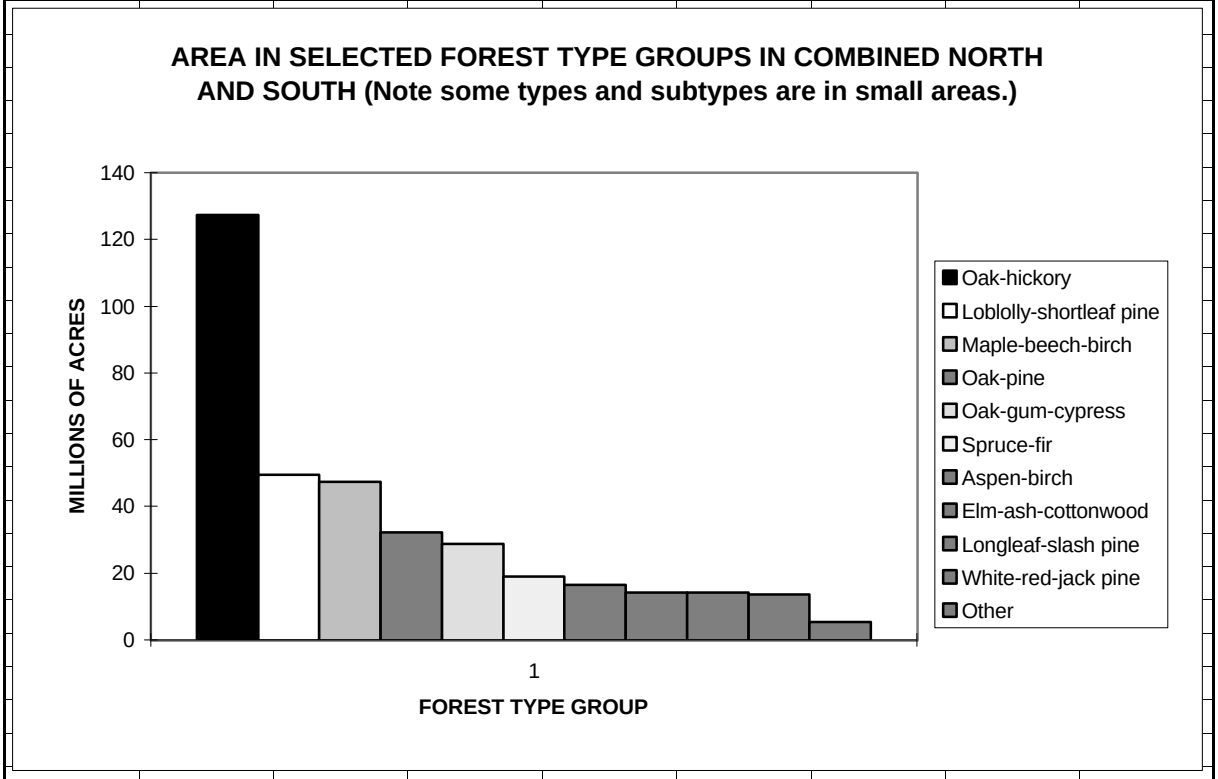


FIGURE B-17. AREAS IN SELECTED FOREST TYPES IN EAST & WEST.



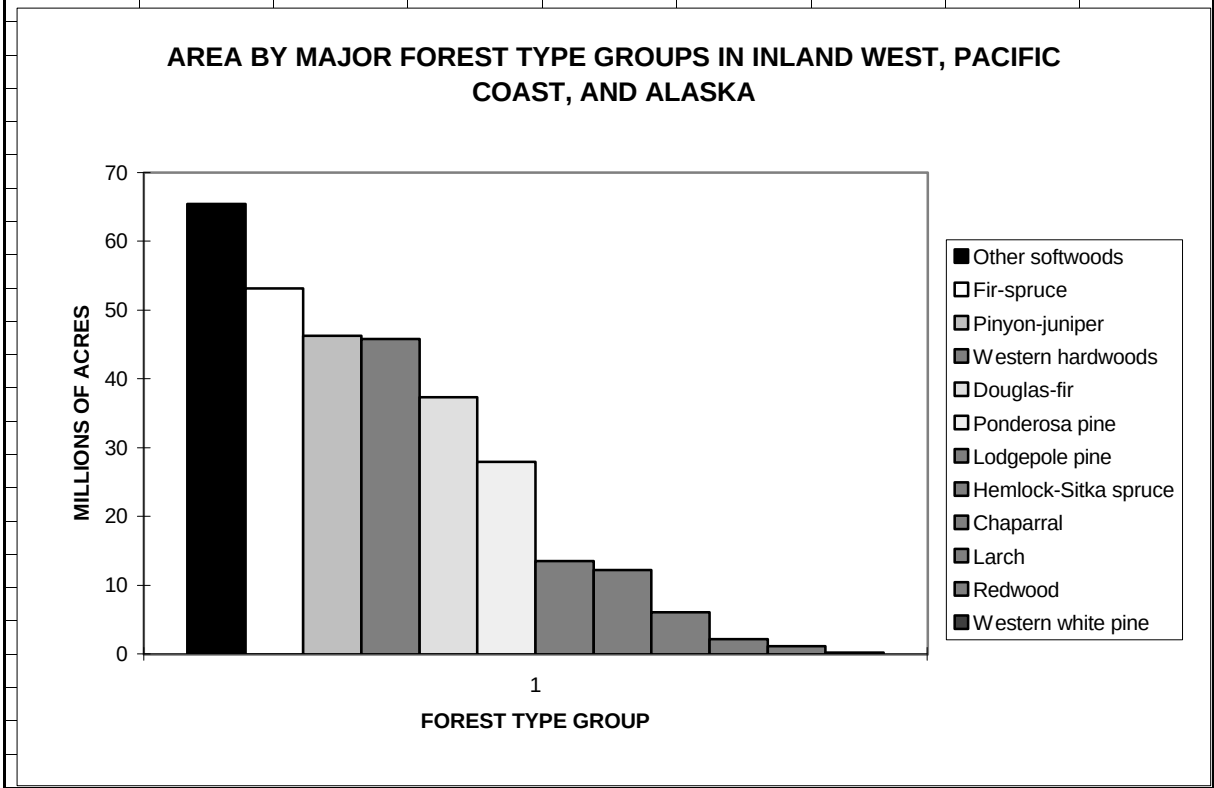


FIGURE B-18. OWNERSHIP OF PRODUCTIVE FORESTS BY REGIONS.

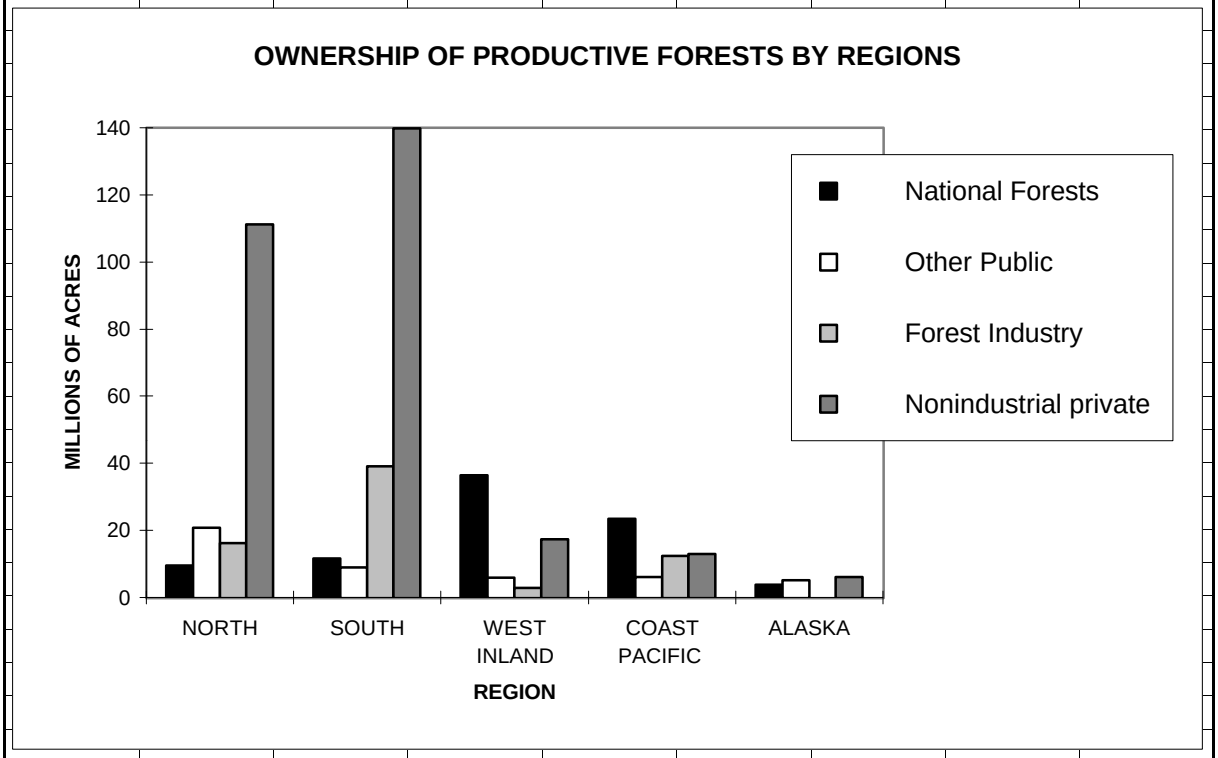


FIGURE B-19. CARBON DIOXIDE RELEASED FROM FOSSIL FUELS TO PRODUCE CONSTRUCTION WOOD OR ITS EQUIVALENT SUBSTITUTE (Koch, 1991).

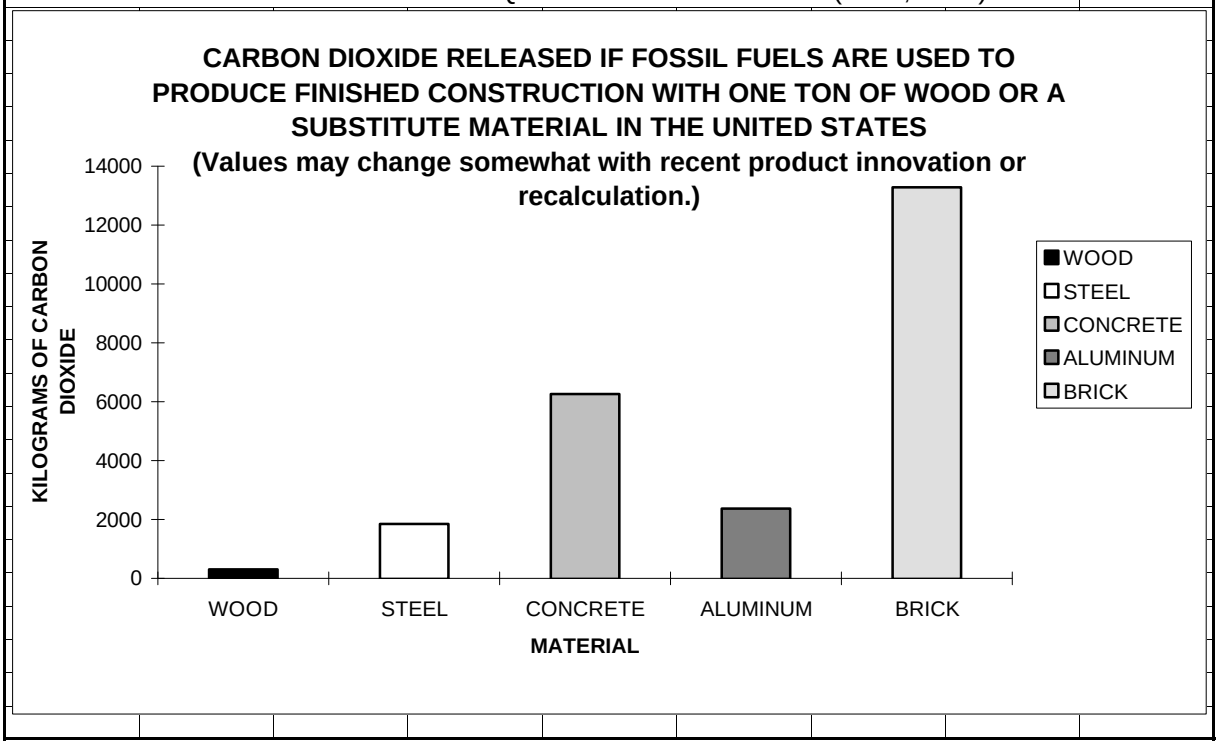


FIGURE B-20. RURAL AND URBAN POPULATION CHANGE, 1940-1990.
(U.S.Department of Commerce, Bureau of the Census, 1995)

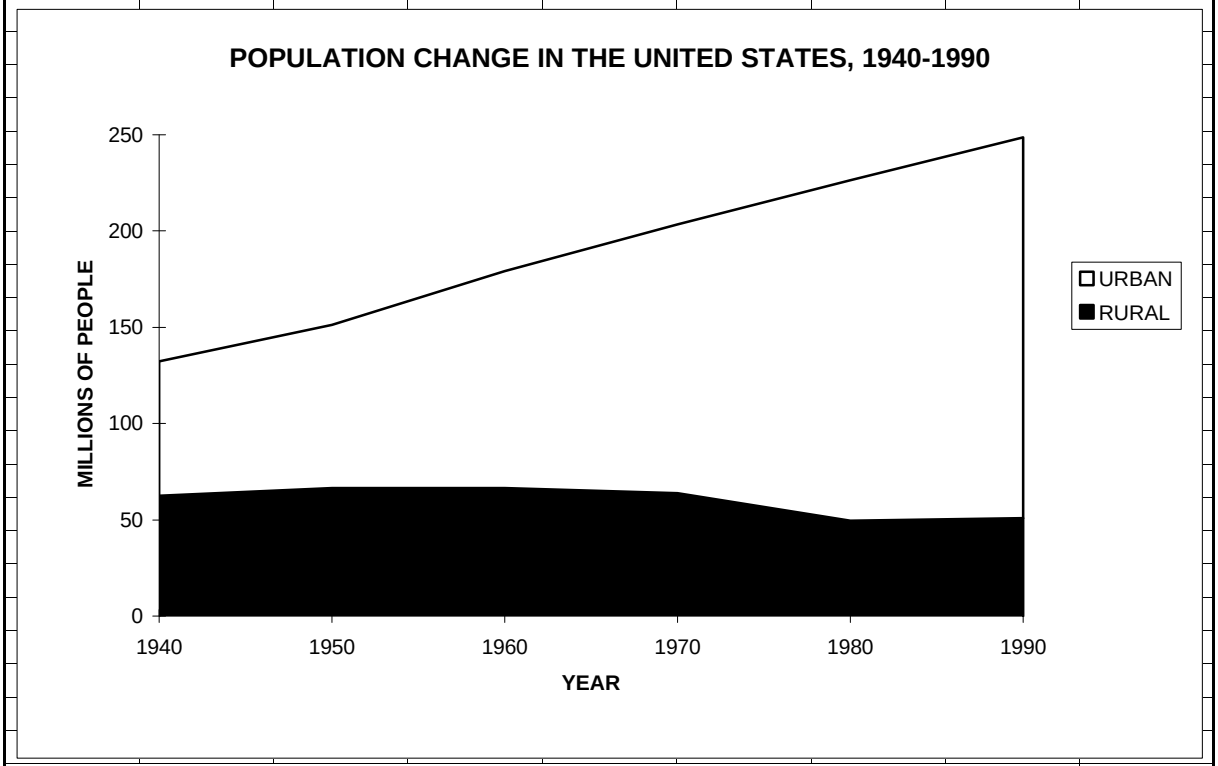
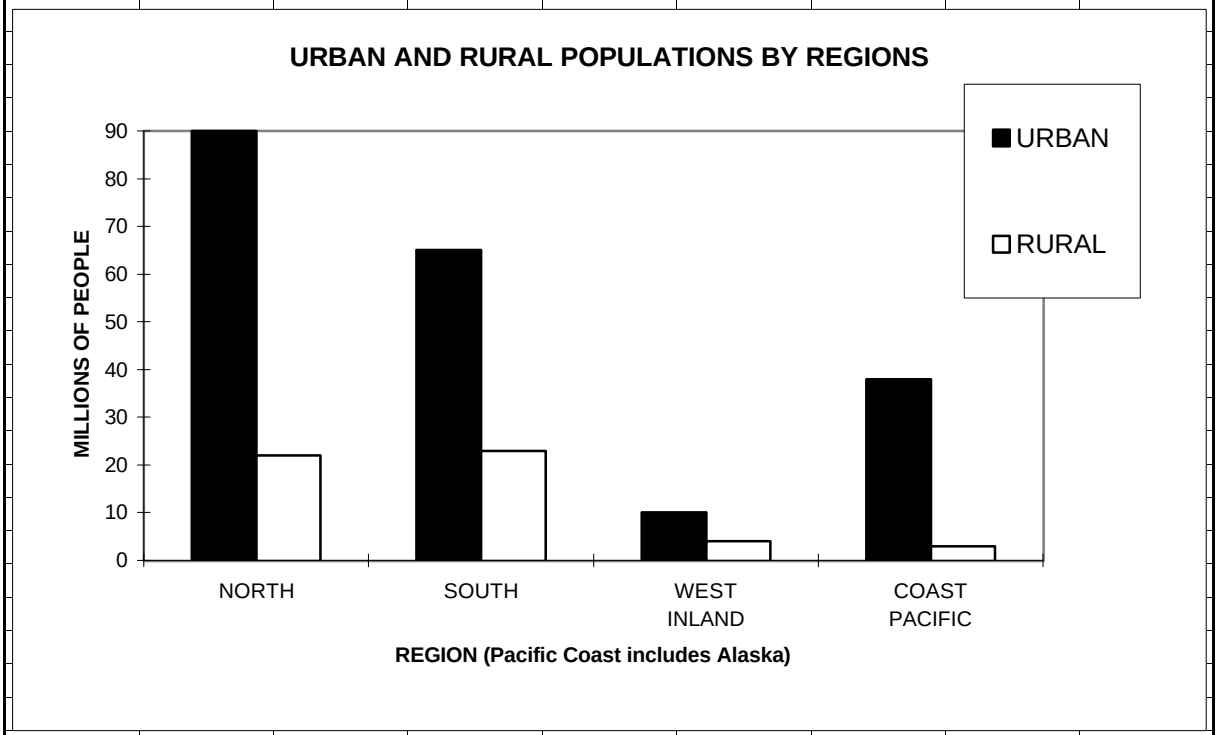


FIGURE B-21. URBAN AND RURAL POPULATIONS BY REGIONS (U.S.Department of. Commerce, Bureau of the Census, 1995)



APPENDIX C: TABLES

CHARACTERISTICS OF FORESTS IN THE UNITED STATES

Unless otherwise stated, data is from Powell et al. 1993. Figures do not account for recent changes (e.g., Northwest Forest Plan of 1993). For definitions of terms, see footnotes in Tables 1, 3, & 4.

APPENDIX C: INFORMATION TABLES SHOWING FOREST CONDITIONS IN THE UNITED STATES. Unless otherwise noted, data is from Powell et al. 1993. Data varies by method of collection. See table 3 for some various definitions.

TABLE C-1. FOREST LAND AREA CHARACTERISTICS BY REGIONS (circa 1992).
(unless otherwise stated, from Powell et al. 1993; data in millions of acres)

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
Total Land Area	414	535	742	208	365	2263
Total Set-Asides[1]	8	11	65	40	149	270
Forest Land Area	168	212	140	87	129	737
Productive Forest[2]	165	202	75	61	21	525
Timberland Area[3]	158	199	63	55	15	490
Productive Reserves[4]	8	3	12	7	6	36
Timberland Ownership						
National Forests	10	12	36	23	4	85
Other Public	21	9	6	6	5	47
Forest Industry	16	39	3	12	0	70
Nonindustrial private	111	140	17	13	6	288

1 Includes forested & nonforested acres; from American Forest & Paper Assoc. 1995.
2 Forest land capable of growing over 20 cubic feet/acre/year of trees under natural conditions.
3 Productive forests not administratively or legislatively withdrawn from active timber management.
4 Productive forests administratively or legislatively withdrawn from active timber management.

TABLE C-2. FOREST LAND AREA CHARACTERISTICS BY REGIONS. (From Powell et al. 1993.)
(For definitions of terms, see Table 1.)

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
Total Land Area (millions of acres)	414	535	742	208	365	2263
Percent of Total Land Area						
Total Set-Asides	2%	2%	9%	19%	41%	12%
Total Forest Land Area	41%	40%	19%	42%	35%	33%
Productive Forest Area	40%	38%	10%	30%	6%	23%
Timberland Area	38%	37%	8%	26%	4%	22%
Productive Reserves	2%	1%	2%	3%	2%	2%
Percent of Productive Forests						
Timberland Area	95%	98%	84%	89%	71%	93%
Productive Resrves	5%	2%	16%	11%	29%	7%
Total Set-Asides	5%	5%	87%	65%	708%	51%
Percent of Timberland Area						
National Forests	6%	6%	58%	43%	25%	17%
Other Public	13%	4%	10%	11%	34%	10%
Forest Industry	10%	20%	5%	22%	0%	14%
Nonindustrial private	71%	70%	28%	24%	41%	59%

TABLE C-3. CHARACTERISTICS OF THE FORESTS BY REGION (Powell et al. 1993; billion cubic feet). Growth and harvest can be expressed in many ways (e.g., removals, harvest, total volume and growing stock, net and gross growth, etc.). Several ways of expressing it are described below.

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
Volume (billion cubic feet)						
Cull living trees[1]	23	23	6	3	1	56
Sound dead trees[2]	3	1	8	3	1	16
Growing stock[3]						
Total	207	251	110	213	35	817
Hardwood	156	148	9	19	4	336
Softwood	51	103	101	195	31	481
Total volume	233	275	124	219	38	889
Annual growing stock change(billion cubic feet, growing stock)						
Gross growth[4]	6.9	12.0	2.9	4.8	0.5	27.1
Mortality	1.6	2.2	0.7	0.8	0.2	5.5
Net growth[5]	5.4	9.8	2.2	4.0	0.3	21.6
Removals[6]	2.8	9.0	0.8	3.5	0.2	16.3
Harvest	2.3	7.6	0.7	3.2	0.2	14.0
Net annual gain	2.6	0.9	1.3	0.5	0.0	5.3
Non-growing stock harvest[7] (billion cubic feet)	2	1	0	1	0	4
Standing growing stock/total volume	89%	91%	89%	98%	94%	92%
Growing stock harvest/total harvest[8]	56%	88%	80%	80%	97%	78%
Growing stock harvest/removals	83%	85%	90%	91%	75%	86%
Total harvest/removals	149%	96%	113%	115%	78%	110%
Gross growing stock changes						
Harvest/gross growth	33%	63%	26%	67%	38%	52%
Removals/gross growth	40%	74%	29%	73%	50%	60%
Mortality/gross growth	23%	18%	24%	17%	43%	20%
Net growing stock changes						
Harvest/net growth	43%	77%	34%	80%	67%	65%
Removals/net growth	52%	91%	38%	88%	89%	75%
Mortality/net growth	29%	22%	32%	20%	76%	25%

1 Living trees >5 inches diameter not useful for sawlogs because of rot, roughness, or species.
2 Net volume in salvageable dead trees.
3 Live trees of commercial species meeting specific standards of quality & vigor.
4 Increase in growing stock, not subtracting mortality.
5 Net increase if growing stock after mortality (but not harvest or other removals) have been subtracted.
6 Timber volume harvested & utilized or otherwise killed by weeding, land clearing, etc.
7 Includes salvage of dead trees, small trees, non-commercial species, and nonforest land.
8 Total harvest = harvest of both growing stock and non-growing stock

TABLE C-4. PER ACRE CHARACTERISTICS OF THE FORESTS BY REGION.
(From Powell et al. 1993. See Table C-3 for information re. footnotes 3 through 6.)

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
Volume (cubic feet/acre)						
Cull living trees[1]	145	116	100	49	56	114
Sound dead trees[2]	20	6	125	48	95	33
Growing stock[3] (cubic feet/acre)						
Total	1,313	1,257	1,760	3,898	2,348	1,668
Hardwood	990	741	140	346	281	686
Softwood	323	516	1,620	3,552	2,067	983
Total volume	1,477	1,379	1,985	3,995	2,499	1,815
Annual growing stock change(cubic feet/acre)						
Gross growth[4]	44	60	46	88	32	55
Mortality	10	11	11	15	14	11
Net growth	34	49	35	73	18	44
Removals[5]	18	45	13	64	16	33
Harvest[6]	15	38	12	58	12	29
Net annual gain	16	4	21	9	2	11
Mean diameter (inches)[1]	11	13	15	22	22	17
Mean age estimate, year[2]	39	25	51	53	131	38

1 Estimated from RPA data on volume by diameter classes.
2 RPA data does not include age. Age is estimated as Net growing stock growth divided by Growing stock.

TABLE C-5. CHANGES IN GROWING STOCK BY REGIONS.
(Powell et al. 1993; millions of cubic feet)

HARDWOODS

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
1952	77	88	5	10	4	184
1962	95	99	6	12	4	216
1977	119	122	6	14	4	266
1987	142	139	8	19	4	313
1992	156	148	9	19	4	336

SOFTWOODS

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	TOTAL
1952	27	60	88	257	49	481
1962	34	75	93	248	49	499
1977	44	101	95	227	48	515
1987	48	106	100	199	37	490
1992	51	103	101	195	31	481

TABLE C-6. FOREST PRODUCTIVITY & POTENTIAL FOR INCREASES IN TIMBER PRODUCTION BY INCREASED GROWTH, HARVEST, AND RECOVERY OF MORTALITY.

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
FOREST LAND AREA BY PRODUCTIVITY CLASS (millions of acres)						
120 FT3/ACRE/YEAR	6	35	3	20	2	66
'85-120 FT3/ACRE/YEAR	25	55	8	11	1	101
'50-85 FT3/ACRE/YEAR	58	82	19	14	1	174
'20-50 FT3/ACRE/YEAR	68	27	29	10	11	145
'0-20 FT3/ACRE/YEAR[1]	3	9	60	24	103	199
POTENTIAL AND ACTUAL REGIONAL TIMBER GROWTH (billions of cubic feet/year)						
POTENTIAL GROWTH[2]	9.8	17.0	3.5	5.2	0.9	36
PRESENT GROSS GROWTH[3]	6.9	12.0	2.9	4.8	0.5	27.1
PRESENT NET GROWTH[3]	5.4	9.8	2.2	4.0	0.3	21.6
PRESENT MORTALITY[3]	1.6	2.2	0.7	0.8	0.2	5.5
PRESENT REMOVALS[3]	2.8	9.0	0.8	3.5	0.2	16.3
POTENTIAL FOR INCREASING SUSTAINABLE TIMBER HARVEST (billions of cubic feet/year)						
BY INCREASING VOLUME HARVEST TO POTENTIAL GROWTH4	7.0	8.1	2.7	1.7	0.6	20.0
BY INCREASING HARVEST TO PRESENT NET GROWTH	2.6	0.9	1.3	0.5	0.0	5.3
BY INCREASING HARVEST TO GROSS GROWTH	4.1	3.1	2.0	1.3	0.2	10.8
POTENTIAL INCREASE AS % OF PRESENT NATIONAL TIMBER REMOVAL (HARVEST)						
PRESENT REMOVAL RATE (1991)	17%	55%	5%	21%	1%	100%
POTENTIAL BY INCREASING VOLUME GROWTH & HARVEST[4]	43%	49%	17%	10%	4%	123%
POTENTIAL BY INCREASING HVST TO PRESENT NET GROWTH	16%	5%	8%	3%	0%	33%
POTENTIAL BY INCREASING HVST TO GROSS GROWTH	25%	19%	12%	8%	1%	66%

1 Lands of less than 20 ft3/acre/year are considered "non-productive, and are not considered in analyses.
2 Calculated from potential growth and acreages, assuming average productivity for each class.
3 From Table 3.
4 Assuming all volume growth, including mortality, can be harvested.

TABLE C-7. TOTAL VOLUME (CONIFER & HARDWOOD) BY REGION AND OWNERSHIP, 1991. (GROWING STOCK, BILLIONS OF CUBIC FEET)

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
CONIFERS						
NATIONAL FOREST	4	9	72	82	19	186
OTHER PUBLIC	7	6	8	23	6	50
INDUSTRY	11	24	5	31	0	71
PRIVATE, NON-INDUSTRY	29	64	17	27	7	143
TOTAL CONIFERS	51	103	101	163	31	450
HARDWOODS						
NATIONAL FOREST	9	11	4	2	0	26
OTHER PUBLIC	20	8	1	3	2	33
INDUSTRY	13	17	0	5	0	35
PRIVATE, NON-INDUSTRY	115	112	4	8	2	242
TOTAL HARDWOODS	156	148	9	19	4	336
ALL SPECIES (CONIFERS & HARDWOODS)						
NATIONAL FOREST	13	19	75	85	19	211
OTHER PUBLIC	27	14	9	26	8	83
INDUSTRY	24	41	5	36	0	106
PRIVATE, NON-INDUSTRY	143	177	21	36	9	386
TOTAL, ALL SPECIES	207	251	110	182	35	786

TABLE C-8A. CHANGES IN TOTAL VOLUME (CONIFER & HARDWOOD) BY REGION AND OWNERSHIP, 1991 (Powell et al. 1993; MILLIONS OF CUBIC FEET)
(See Table 3 for definitions of terms.)

	TOTAL GROWTH	MORTALITY	NET GROWTH	REMOVALS	STANDING VOLUME CHANGE
NORTH					
NATIONAL FOREST	422	110	312	144	168
OTHER PUBLIC	905	249	656	295	361
INDUSTRY	747	195	552	723	-171
PRIVATE, NON-INDUSTRY	4,857	1,016	3,841	1,624	2,217
TOTAL NORTH	6,931	1,570	5,361	2,786	2,575
SOUTH					
NATIONAL FOREST	692	205	487	373	114
OTHER PUBLIC	516	116	400	204	196
INDUSTRY	2,639	344	2,295	2,907	-612
PRIVATE, NON-INDUSTRY	8,191	1,541	6,650	5,468	1,182
TOTAL SOUTH	12,038	2,206	9,832	8,952	880
INLAND WEST					
NATIONAL FOREST	1,815	463	1,352	405	947
OTHER PUBLIC	242	54	188	57	131
INDUSTRY	170	42	128	173	-45
PRIVATE, NON-INDUSTRY	633	129	504	193	311
TOTAL INLAND WEST	2,860	688	2,172	828	1,344
PACIFIC COAST					
NATIONAL FOREST	1,349	297	1,052	980	72
OTHER PUBLIC	716	119	597	423	174
INDUSTRY	1,501	187	1,314	1,522	-208
PRIVATE, NON-INDUSTRY	1,236	208	1,028	578	450
TOTAL PACIFIC COAST	4,802	811	3,991	3,503	488
ALASKA					
NATIONAL FOREST	213	124	89	99	-10
OTHER PUBLIC	153	30	123	5	118
INDUSTRY	0	0	0	0	0
PRIVATE, NON-INDUSTRY	110	53	57	136	-79
TOTAL ALASKA	476	207	269	240	29
ALL REGIONS					
NATIONAL FOREST	4,491	1,199	3,292	2,001	1,291
OTHER PUBLIC	2,532	568	1,964	984	980
INDUSTRY	5,057	768	4,289	5,325	-1,036
PRIVATE, NON-INDUSTRY	15,027	2,947	12,080	7,999	4,081
TOTAL ALL REGIONS	27,107	5,482	21,625	16,309	5,316

TABLE C-8B. CHANGES IN CONIFER VOLUME BY REGION AND OWNERSHIP, 1991.
(Powell et al. 1993; MILLIONS OF CUBIC FEET)
(See Table 3 for definitions of terms.)

	TOTAL GROWTH	MORTALITY	NET GROWTH	REMOVALS	STANDING VOLUME CHANGE
NORTH					
NATIONAL FOREST	140	39	101	46	55
OTHER PUBLIC	255	69	186	71	115
INDUSTRY	348	118	230	348	-118
PRIVATE, NON-INDUSTRY	918	222	696	277	419
TOTAL NORTH	1661	448	1213	742	471
SOUTH					
NATIONAL FOREST	339	114	225	277	-52
OTHER PUBLIC	237	53	184	125	59
INDUSTRY	1874	190	1684	2141	-457
PRIVATE, NON-INDUSTRY	3716	709	3007	3275	-268
TOTAL SOUTH	6166	1066	5100	5818	-718
INLAND WEST					
NATIONAL FOREST	1713	428	1285	395	890
OTHER PUBLIC	221	50	171	56	115
INDUSTRY	169	42	127	172	-45
PRIVATE, NON-INDUSTRY	487	85	402	174	228
TOTAL INLAND WEST	2590	605	1985	797	1188
PACIFIC COAST					
NATIONAL FOREST	1346	294	1052	964	88
OTHER PUBLIC	615	94	521	403	118
INDUSTRY	1292	143	1149	1452	-303
PRIVATE, NON-INDUSTRY	926	146	780	545	235
TOTAL PACIFIC COAST	4179	677	3502	3364	138
ALASKA					
NATIONAL FOREST	209	124	85	99	-14
OTHER PUBLIC	92	24	68	3	65
INDUSTRY	0	0	0	0	0
PRIVATE, NON-INDUSTRY	68	49	19	133	-114
TOTAL ALASKA	369	197	172	235	-63
ALL REGIONS					
NATIONAL FOREST	3747	999	2748	1781	967
OTHER PUBLIC	1420	290	1130	658	472
INDUSTRY	3683	493	3190	4113	-923
PRIVATE, NON-INDUSTRY	6115	1211	4904	4404	500
TOTAL ALL REGIONS	14965	2993	11972	10956	1016

TABLE C-8C. CHANGES IN HARDWOOD VOLUME BY REGION AND OWNERSHIP, 1991.
(Powell et al. 1993; MILLIONS OF CUBIC FEET)
(See Table 3 for definitions of terms.)

	TOTAL GROWTH	MORTALITY	NET GROWTH	REMOVALS	STANDING VOLUME CHANGE
NORTH					
NATIONAL FOREST	282	71	211	98	113
OTHER PUBLIC	650	180	470	224	246
INDUSTRY	399	77	322	375	-53
PRIVATE, NON-INDUSTRY	3939	794	3145	1347	1798
TOTAL NORTH	5270	1122	4148	2044	2104
SOUTH					
NATIONAL FOREST	353	91	262	96	166
OTHER PUBLIC	279	63	216	79	137
INDUSTRY	765	154	611	766	-155
PRIVATE, NON-INDUSTRY	4475	832	3643	2193	1450
TOTAL SOUTH	5872	1140	4732	3134	1598
INLAND WEST					
NATIONAL FOREST	102	35	67	10	57
OTHER PUBLIC	21	4	17	1	16
INDUSTRY	1	0	1	1	0
PRIVATE, NON-INDUSTRY	146	44	102	19	83
TOTAL INLAND WEST	270	83	187	31	156
PACIFIC COAST					
NATIONAL FOREST	3	3	0	16	-16
OTHER PUBLIC	101	25	76	20	56
INDUSTRY	209	44	165	70	95
PRIVATE, NON-INDUSTRY	310	62	248	33	215
TOTAL PACIFIC COAST	623	134	489	139	350
ALASKA					
NATIONAL FOREST	4	0	4	0	4
OTHER PUBLIC	61	6	55	2	53
INDUSTRY	0	0	0	0	0
PRIVATE, NON-INDUSTRY	42	4	38	3	35
TOTAL ALASKA	107	10	97	5	92
ALL REGIONS					
NATIONAL FOREST	744	200	544	220	324
OTHER PUBLIC	1112	278	834	326	508
INDUSTRY	1374	275	1099	1212	-113
PRIVATE, NON-INDUSTRY	8912	1736	7176	3595	3581
TOTAL ALL REGIONS	12142	2489	9653	5353	4300

TABLE C-9A. RELATIVE CHARACTERISTICS OF VOLUME CHANGES BY REGION AND OWNERSHIP FOR BOTH CONIFERS & HARDWOODS, 1991. (See Tables 3 & 4 for definitions.)

	GROSS GROWTH/ GROWING STOCK	MORTALITY/ GROWING STOCK	REMOVALS/ GROSS GROWTH	REMOVALS/ NET GROWTH	STANDING VOLUME CHANGE/ GR.GROWTH	STANDING VOLUME CHANGE/ ST.VOL.	AGE (ST.VOL./ GROSS GROWTH)	STANDING VOLUME/ ACRE (thou.FT3)
NORTH								
NATIONAL FOREST	3.3%	0.9%	34%	46%	40%	1.3%	31	1.3
OTHER PUBLIC	3.4%	0.9%	33%	45%	40%	1.3%	30	1.3
INDUSTRY	3.1%	0.8%	97%	131%	-23%	-0.7%	32	1.5
PRIVATE, NON-INDUSTRY	3.4%	0.7%	33%	42%	46%	1.5%	30	1.3
TOTAL NORTH	3.3%	0.8%	40%	52%	37%	1.2%	30	1.3
SOUTH								
NATIONAL FOREST	3.6%	1.1%	54%	77%	16%	0.6%	28	1.7
OTHER PUBLIC	3.8%	0.9%	40%	51%	38%	1.4%	26	1.5
INDUSTRY	6.4%	0.8%	110%	127%	-23%	-1.5%	16	1.1
PRIVATE, NON-INDUSTRY	4.6%	0.9%	67%	82%	14%	0.7%	22	1.3
TOTAL SOUTH	4.8%	0.9%	74%	91%	7%	0.4%	21	1.3
INLAND WEST								
NATIONAL FOREST	2.4%	0.6%	22%	30%	52%	1.3%	42	2.1
OTHER PUBLIC	2.7%	0.6%	24%	30%	54%	1.4%	37	1.5
INDUSTRY	3.5%	0.9%	102%	135%	-26%	-0.9%	29	1.7
PRIVATE, NON-INDUSTRY	3.0%	0.6%	30%	38%	49%	1.5%	33	1.2
TOTAL INLAND WEST	2.6%	0.6%	29%	38%	47%	1.2%	39	1.8
PACIFIC COAST								
NATIONAL FOREST	1.6%	0.4%	73%	93%	5%	0.1%	63	3.1
OTHER PUBLIC	2.7%	0.5%	59%	71%	24%	0.7%	36	2.3
INDUSTRY	4.2%	0.5%	101%	116%	-14%	-0.6%	24	2.9
PRIVATE, NON-INDUSTRY	3.5%	0.6%	47%	56%	36%	1.3%	29	1.9
TOTAL PACIFIC COAST	2.6%	0.4%	73%	88%	10%	0.3%	38	2.6
ALASKA								
NATIONAL FOREST	1.1%	0.7%	46%	111%	-5%	-0.1%	89	5.0
OTHER PUBLIC	2.0%	0.4%	3%	4%	77%	1.6%	49	1.5
INDUSTRY	0.0%	0.0%	0%	0%	0%	0.0%	0	0.0
PRIVATE, NON-INDUSTRY	1.2%	0.6%	124%	239%	-72%	-0.9%	81	1.4
TOTAL ALASKA	1.3%	0.6%	50%	89%	6%	0.1%	74	2.3
ALL REGIONS								
NATIONAL FOREST	2.1%	0.6%	45%	61%	29%	0.6%	47	2.5
OTHER PUBLIC	3.1%	0.7%	39%	50%	39%	1.2%	33	1.8
INDUSTRY	4.8%	0.7%	105%	124%	-20%	-1.0%	21	1.5
PRIVATE, NON-INDUSTRY	3.9%	0.8%	53%	66%	27%	1.1%	26	1.3
TOTAL ALL REGIONS	3.5%	0.7%	60%	75%	20%	0.7%	29	1.6

TABLE C-9B. RELATIVE CHARACTERISTICS OF VOLUME CHANGES BY REGION AND OWNERSHIP FOR CONIFERS, 1991.
(See Tables 3 & 4 for definitions.)

	GROSS GROWTH/ GROWING STOCK	MORTALITY/ GROWING STOCK	REMOVALS/ GROSS GROWTH	REMOVALS/ NET GROWTH	STANDING VOLUME CHANGE/ GR.GROWTH	STANDING VOLUME CHANGE/ ST.VOL.	AGE (ST.VOL./ GROSS GROWTH)
NORTH							
NATIONAL FOREST	3.6%	1.0%	33%	46%	39%	1.4%	28
OTHER PUBLIC	3.5%	1.0%	28%	38%	45%	1.6%	28
INDUSTRY	3.1%	1.0%	100%	151%	-34%	-1.0%	32
PRIVATE, NON-INDUSTRY	3.2%	0.8%	30%	40%	46%	1.5%	31
TOTAL NORTH	3.3%	0.9%	45%	61%	28%	0.9%	31
SOUTH							
NATIONAL FOREST	3.8%	1.3%	82%	123%	-15%	-0.6%	26
OTHER PUBLIC	4.2%	0.9%	53%	68%	25%	1.0%	24
INDUSTRY	7.8%	0.8%	114%	127%	-24%	-1.9%	13
PRIVATE, NON-INDUSTRY	5.8%	1.1%	88%	109%	-7%	-0.4%	17
TOTAL SOUTH	6.0%	1.0%	94%	114%	-12%	-0.7%	17
INLAND WEST							
NATIONAL FOREST	2.4%	0.6%	23%	31%	52%	1.2%	42
OTHER PUBLIC	2.6%	0.6%	25%	33%	52%	1.4%	38
INDUSTRY	3.5%	0.9%	102%	135%	-27%	-0.9%	28
PRIVATE, NON-INDUSTRY	2.9%	0.5%	36%	43%	47%	1.4%	34
TOTAL INLAND WEST	2.6%	0.6%	31%	40%	46%	1.2%	39
PACIFIC COAST							
NATIONAL FOREST	1.6%	0.4%	72%	92%	7%	0.1%	61
OTHER PUBLIC	2.7%	0.4%	66%	77%	19%	0.5%	37
INDUSTRY	4.2%	0.5%	112%	126%	-23%	-1.0%	24
PRIVATE, NON-INDUSTRY	3.4%	0.5%	59%	70%	25%	0.9%	29
TOTAL PACIFIC COAST	2.6%	0.4%	80%	96%	3%	0.1%	39
ALASKA							
NATIONAL FOREST	1.1%	0.7%	47%	116%	-7%	-0.1%	90
OTHER PUBLIC	1.6%	0.4%	3%	4%	71%	1.1%	63
INDUSTRY	0.0%	0.0%	0%	0%	0%	0.0%	0
PRIVATE, NON-INDUSTRY	1.0%	0.7%	196%	700%	-168%	-1.7%	98
TOTAL ALASKA	1.2%	0.6%	64%	137%	-17%	-0.2%	84
ALL REGIONS							
NATIONAL FOREST	2.0%	0.5%	48%	65%	26%	0.5%	50
OTHER PUBLIC	2.8%	0.6%	46%	58%	33%	0.9%	35
INDUSTRY	5.2%	0.7%	112%	129%	-25%	-1.3%	19
PRIVATE, NON-INDUSTRY	4.3%	0.8%	72%	90%	8%	0.3%	23
TOTAL ALL REGIONS	3.3%	0.7%	73%	92%	7%	0.2%	30

TABLE C9-C. RELATIVE CHARACTERISTICS OF VOLUME CHANGES BY REGION AND OWNERSHIP FOR HARDWOODS, 1991.
(See Tables 3 & 4 for definitions.)

	GROSS GROWTH/ GROWING STOCK	MORTALITY/ GROWING STOCK	REMOVALS/ GROSS GROWTH	REMOVALS/ NET GROWTH	STANDING VOLUME CHANGE/ GR.GROWTH	STANDING VOLUME CHANGE/ ST.VOL.	AGE (ST.VOL./ GROSS GROWTH)
NORTH							
NATIONAL FOREST	3.2%	0.8%	35%	46%	40%	1.3%	32
OTHER PUBLIC	3.3%	0.9%	34%	48%	38%	1.3%	30
INDUSTRY	3.1%	0.6%	94%	116%	-13%	-0.4%	32
PRIVATE, NON-INDUSTRY	3.4%	0.7%	34%	43%	46%	1.6%	29
TOTAL NORTH	3.4%	0.7%	39%	49%	40%	1.3%	30
SOUTH							
NATIONAL FOREST	3.4%	0.9%	27%	37%	47%	1.6%	30
OTHER PUBLIC	3.5%	0.8%	28%	37%	49%	1.7%	28
INDUSTRY	4.5%	0.9%	100%	125%	-20%	-0.9%	22
PRIVATE, NON-INDUSTRY	4.0%	0.7%	49%	60%	32%	1.3%	25
TOTAL SOUTH	4.0%	0.8%	53%	66%	27%	1.1%	25
INLAND WEST							
NATIONAL FOREST	2.7%	0.9%	10%	15%	56%	1.5%	37
OTHER PUBLIC	3.0%	0.6%	5%	6%	76%	2.3%	33
INDUSTRY	3.0%	0.0%	100%	100%	0%	0.0%	33
PRIVATE, NON-INDUSTRY	3.4%	1.0%	13%	19%	57%	2.0%	29
TOTAL INLAND WEST	3.1%	0.9%	11%	17%	58%	1.8%	32
PACIFIC COAST							
NATIONAL FOREST	0.1%	0.1%	533%	0%	-533%	-0.7%	739
OTHER PUBLIC	3.3%	0.8%	20%	26%	55%	1.8%	31
INDUSTRY	4.1%	0.9%	33%	42%	45%	1.9%	24
PRIVATE, NON-INDUSTRY	3.6%	0.7%	11%	13%	69%	2.5%	27
TOTAL PACIFIC COAST	3.3%	0.7%	22%	28%	56%	1.8%	30
ALASKA							
NATIONAL FOREST	2.3%	0.0%	0%	0%	100%	2.3%	44
OTHER PUBLIC	3.5%	0.3%	3%	4%	87%	3.0%	29
INDUSTRY	0.0%	0.0%	0%	0%	0%	0.0%	0
PRIVATE, NON-INDUSTRY	1.8%	0.2%	7%	8%	83%	1.5%	55
TOTAL ALASKA	2.5%	0.2%	5%	5%	86%	2.2%	40
ALL REGIONS							
NATIONAL FOREST	2.9%	0.8%	30%	40%	44%	1.3%	34
OTHER PUBLIC	3.4%	0.8%	29%	39%	46%	1.5%	30
INDUSTRY	3.9%	0.8%	88%	110%	-8%	-0.3%	25
PRIVATE, NON-INDUSTRY	3.7%	0.7%	40%	50%	40%	1.5%	27
TOTAL ALL REGIONS	3.6%	0.7%	44%	55%	35%	1.3%	28

TABLE C-10. ANNUAL MORTALITY, ACRES, AND MORTALITY/ACRE BY REGION, YEAR, AND OWNERSHIP

	MORTALITY (millions of cubic feet)					millions of acres					Mortality: cubic feet/acre				
	1952	1962	1976	1986	1991	1952	1962	1976	1986	1991	1952	1962	1976	1986	1991
North															
National Forests	48	70	70	85	110	10	10	9	9	10	4.9	7.2	7.6	9.0	11.5
Other Public	87	136	184	195	248	19	19	19	21	21	4.5	7.3	9.5	9.5	12.0
Private Industrial	91	125	175	178	195	14	14	17	17	16	6.6	9.1	10.0	10.5	12.0
Private Non-industrial	464	609	719	786	1,016	111	114	107	108	111	4.2	5.3	6.7	7.3	9.1
Total	690	940	1,149	1,243	1,569	154	157	153	154	158	4.5	6.0	7.5	8.1	9.9
South															
National Forests	55	68	80	113	205	11	11	11	12	12	5.1	6.1	7.0	9.6	17.7
Other Public	29	41	57	82	117	7	7	7	8	9	4.3	6.2	8.2	10.1	13.0
Private Industrial	178	227	231	286	344	32	34	37	38	39	5.6	6.7	6.3	7.5	8.8
Private Non-industrial	711	833	911	1,191	1,542	155	157	144	139	140	4.6	5.3	6.3	8.5	11.0
Total	972	1,169	1,278	1,673	2,208	205	209	200	197	199	4.8	5.6	6.4	8.5	11.1
Inland West															
National Forests	408	441	292	392	463	42	43	36	36	36	9.7	10.4	8.0	11.0	12.7
Other Public	76	76	78	56	54	5	5	4	6	6	16.7	16.9	18.8	9.9	9.1
Private Industrial	23	23	23	28	42	2	2	2	3	3	10.1	10.5	10.9	9.3	14.3
Private Non-industrial	121	126	135	70	129	18	18	17	17	17	6.8	7.1	7.7	4.1	7.4
Total	628	667	527	545	688	67	67	60	61	63	9.4	10.0	8.8	8.9	11.0
Pacific Coast															
National Forests	793	795	565	463	421	32	33	31	28	27	24.7	23.8	17.9	16.4	15.5
Other Public	301	279	262	166	148	20	19	19	12	11	15.0	14.3	13.7	14.4	13.3
Private Industrial	323	290	182	133	187	11	12	13	12	12	28.8	24.4	14.5	10.7	15.2
Private Non-industrial	198	194	130	183	260	20	18	16	20	19	10.0	10.7	8.1	9.2	13.5
Total	1,614	1,558	1,139	945	1,016	83	83	79	72	70	19.4	18.8	14.4	13.1	14.6
All regions															
National Forests	1,304	1,375	1,007	1,053	1,199	95	97	89	85	85	13.8	14.2	11.4	12.4	14.2
Other Public	493	532	580	499	568	50	49	49	46	47	9.8	10.8	11.7	10.9	12.1
Private Industrial	613	665	611	624	768	59	61	69	70	70	10.4	10.8	8.9	8.9	10.9
Private Non-industrial	1,494	1,762	1,895	2,230	2,946	304	308	285	284	288	4.9	5.7	6.6	7.9	10.2
Total	3,905	4,334	4,093	4,406	5,481	509	515	492	485	490	7.7	8.4	8.3	9.1	11.2

TABLE C-11. MEASURABLE CHARACTERISTICS OF POPULATION AND WOOD PRODUCTION & CONSUMPTION. (U.S.Dept. of Commerce, 1995).

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
Total Population (millions)	112	88	14	41	(Ak in PC)[1]	255
Rural Population(percent of total)	20%	26%	29%	7%	(Ak in PC)	
Rural people/ acre	0.32	0.25	0.02	0.02	(Ak in PC)	
Labor force in Forestry (millions)	1.61					
% of labor force in Forestry	1%					

TABLE C-12. REGIONAL POTENTIAL FOR INCREASES IN EMPLOYMENT IN FORESTRY AND FOREST PRODUCTS (Employment in thousands; harvest in billion cubic feet)

DIRECT EMPLOYMENT IN FORESTRY & TIMBER PRODUCTS:[1] 1,613 thousand

TIMBER HARVEST 16 billion cubic feet

DIRECT EMPLOYMENT PER BILLION FT3 (NATIONAL AVERAGE): 99 thousand people/billion board feet

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA	ALL REGIONS
POTENTIAL FOR INCREASING TIMBER EMPLOYMENT (thousands of employees/year)						
POTENTIAL BY INCREASING VOLUME GROWTH & HARVEST[2]	690	798	267	165	61	1,982
POTENTIAL BY INCREASING HVST TO PRESENT NET GROWTH	255	87	133	48	3	527
POTENTIAL BY INCREASING HVST TO GROSS GROWTH	410	306	201	129	23	1,069
POTENTIAL INCREASE AS % OF PRESENT NATIONAL TIMBER REMOVAL (HARVEST)						
POTENTIAL BY INCREASING VOLUME GROWTH & HARVEST[2]	43%	49%	17%	10%	4%	123%
POTENTIAL BY INCREASING HVST TO PRESENT NET GROWTH	16%	5%	8%	3%	0%	33%
POTENTIAL BY INCREASING HVST TO GROSS GROWTH	25%	19%	12%	8%	1%	66%

1 Source: Compiled by the American Forest & Paper Association from data maintained by the U.S. Department of Commerce, Regional Economic Information System Database and County Business Patterns. American Forst & Paper Association, 1995. U.S.Forests: Facts and Figures, 1995. Published by the American Forest & Paper Association, 1111 19th Street, N.W., Washington, D.C. 20036.

2 Assuming all volume growth, including mortality, can be harvested.

TABLE C-13. SOME THREATENED & ENDANGERED FOREST SPECIES IN EACH REGION:

North:

- **Karner blue butterfly (*Lycaeides melissa samuelis*)**
- **Eastern cougar (*Felis concolor cougar*)**
- **Virginia northern flying squirrel (*Glaucomys asbrinus fuscus*)**
- **Extinct**
  - **Wood bison (*Bison bison athabascae*) populations found in Canada**
  - **Heath hen (*Tympanuchus cupido cupido*)**

South

- **Eastern cougar (*Felis concolor cougar*)**
- **Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*)**
- **Red-cockaded woodpecker (*Picoides borealis*)**
- **Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*)**
- **Red wolf (*Canis rufus*)**
- **Florida panther (*Felis concolor coryi*)**
- **American black bear (*Ursus americanus*)**
- **Louisiana black bear (*Ursus americanus luteolus*)**
- **Extinct:**
  - **Ivory billed woodpecker (*Campephilus principalis*)**

Inland West

- **Woodland caribou (*Rangifer tarandus caribou*)**
- **Brown bear or grizzly bear (*Ursus arctos horribilis*)**
- **Mexican spotted owl (*Strix occidentalis lucida*)**

Pacific Coast

- **Oregon silverspot butterfly (*Speyeria zerene hippolyta*)**
- **Columbian white-tailed deer (*Odocoileus virginianus leucurus*)**
- **Northern spotted owl (*Strix occidentalis caurina*)**
- **Woodland caribou (*Rangifer tarandus caribou*)**
- **Brown bear or grizzly bear (*Ursus arctos horribilis*)**
- **Lotis blue butterfly (*Lycaeides argyrognomon lotis*)**
- **Marbled murrelet (*Brachyramphus marmoratus marmoratus*)**

REF: Lowe, D.W., J.R.Matthews, and C.J.Moseley (editors). 1990. The official World Wildlife Fund guide to endangered species of North America. Beacham Publishing, Inc. Washington, D.C. Four volumes.

TABLE C-14. PARTIAL ESTIMATE OF RECREATION AREA IN EACH REGION (MILLIONS OF ACRES) (Account includes non-forested lands)

	NORTH	SOUTH	INLAND WEST	PACIFIC COAST	ALASKA
TOTAL FEDERAL LANDS					
"BACKCOUNTRY"	4.2	6.6	96.1	39.4	132.0
"NON-BACKCOUNTRY"	9.3	13.7	161.8	43.2	248.6
TOTAL STATE LANDS					
"BACKCOUNTRY"	3.3	8.5	0.6	1.1	3.1
"NON-BACKCOUNTRY"	14.2	2.1	4.3	4.7	2.2
PRIVATE, NON-INDUSTRIAL LANDS					
"OPEN FOR RECREATION"	66.7	53.7	97.8	11.5	0.0
"FEE FOR RECREATION"	5.9	34.7	3.2	0.1	0.0
TOTAL AREA	103.5	119.3	363.8	100.2	385.9
"BACKCOUNTRY"	7.5	15.1	96.7	40.6	135.1
"NON-BACKCOUNTRY"	96.1	104.2	267.1	59.6	250.8

(source: Watson, A.H., compiler. 1989. Outdoor recreation benchmark 1988: Proceedings of the Outdoor Recreation Forum, Tampa, Florida, January 13-14, 1988. USDA Forest Service General Technical Report SE-52.

TABLE C-15. COMPARISON OF UNITED STATES AND WORLD FORESTS AND TIMBER CONSUMPTION, 1990.

	WORLD	UNITED STATES
POPULATION (billion)	5.3	0.25
% OF WORLD		5%
CLOSEDFOREST AREA (million acres)	6977.8	558.22
% OF WORLD		8%
ANNUAL CHANGE IN CLOSED FOREST	-0.4	-0.1
TIMBER INVENTORY(bill. ft3)	10714.2	749.99
% OF WORLD		7%
TIMBER PRODUCTION (bill. ft3)	112.5	18.00
% OF WORLD		16%
TIMBER CONSUMPTION (bill. ft3)	127.1	21.60
% OF WORLD PRODUCTION		19%
% OF WORLD CONSUMPTION		17%
NET IMPORT (bill. ft3)		3.60
% OF WORLD PRODUCTION		3%
% OF WORLD CONSUMPTION		3%
POTENTIAL EXPORT IF HARVEST = GROWTH (billion ft3)		5.40
% OF WORLD PRODUCTION		5%
% OF WORLD CONSUMPTION		4%

from Brooks, D.J. Introduction: forests on the global agenda. In The New Eco-Order. The Northwest Policy Ctr, Univ. of Washington. 1995.

APPENDIX D: BACKGROUND

The Forestry Issues

Concerns about how our forests are managed have existed for hundreds of years. Forest management policies have emerged both directly from conscious decisions by policymakers and indirectly as unintended consequences of various legislation, technology changes, population shifts, economic changes, and others.

The past decade has seen increasing concern that the forests are not achieving the many values people desire of them. The results of laws, administrative actions, court rulings, and business behavior have led to confused “de facto” forest policies.

Forest Health

Immediate concern for some objectives has led to the term “forest health”, as a way to cover a range of issues; however, the term itself has become controversial since it has been defined and redefined to meet different objectives.

Forest Health Science Committee

The Honorable Charles H. Taylor, United States Congress, 11th District of North Carolina, assembled a group of scientists, primarily from academia, with the attempt to avoid industrial, government (e.g. Forest Service), or lobbying influences. His stated objectives, through a series of questions, was to educate himself and others on the forest science basis of the issues. His expressed hope was to achieve a bipartisan understanding and resolution on the forestry issues and to provide specific proposals to policymakers which will form a more consistent, explicit forest policy (as opposed to the present “de facto” policy).

Congressman Taylor began the panel with a series of questions; however, once the panel was assembled, he has given it free reign to alter the questions and approach. His involvement has been primarily to facilitate and make visible the work of the panel. Consultation of the panel with him has primarily been to inform him of the findings and to get advice on the best ways to present the results for ease of understanding (e.g., matrix VS “bullet” approaches). His stated approach has been to trust that the science will lead to an understanding, and so the best chance for resolution.

Approach of the Panel

The panel has taken a management science approach of policy analysis. We have attempted to separate the analysis of conditions and alternatives from value judgments. The former is the role of the panel, the latter is the role of policymakers.

The objectives of the panel are to clarify the conditions of the forests, the alternative approaches to managing them, the tradeoffs/consequences of the

different approaches, and specific steps which can be taken to achieve the desired approach.

To fulfill its objectives, the panelists have exchanged written papers, e-mail, regular mail, Fax's, phone calls, and conference calls. They have met several times and given public presentations of the panel's approach and findings, followed by input from the audience. The panel will continue to seek public input.

The panel is dividing its work into "white papers." The intended papers cover the topics:

1. "Forest health"? What does it mean, and why is it important?
2. What is the present condition of our forests relative to these values?
3. What are the factors which enable the forests to achieve or not achieve the various values?
4. What are the alternative approaches to managing our forests?
5. What specific factors could be changed, and how, to achieve the alternative approaches?

The approach of the panel has been to gain an understanding of each topic. Where there was any question or difference of opinion raised among the panel members or at any meeting, the questions and/or differences were resolved by examining information.

APPENDIX E. BIOGRAPHIC INFORMATION OF PANEL MEMBERS

David L. Adams, Ph.D., Professor, College of Forestry, Wildlife and Range Sciences, University of Idaho, Moscow, ID.

Professor Adams earned is B.S. degree in Forest Management at Oklahoma State University, M.F. in Forest Mensuration at the University of Idaho, and his Ph.D. in Silviculture at Colorado State University. He worked in timber management with the USDA Forest Service, and held teaching and research positions at Colorado State University, Humboldt State University, and the University of Idaho where he also served for 15 years as chair of the Forest Resources Department. He has been at the University of Idaho for 25 years and currently teaches and does research in silviculture.

Professor Adams is a Fellow in the Society of American Foresters and has held several local, regional and national offices. His forest health emphasis includes serving as the University of Idaho representative on a regional Forest Health Partnership, as co-editor of Assessing Forest Health in the Inland West, and as an author of Forest Health Conditions in Idaho. Professor Adams has testified on forest health before US House and State of Idaho Senate committees, served on a international panel to advise the State of Alaska on forest health issues.

Thomas M. Bonnicksen, Ph.D., Professor, Department of Forest Science, College of Agriculture and Life Sciences, Texas A&M University, College Station, Texas.

Professor Bonnicksen earned his B.S. in Forestry, his M.S. in Forest Ecology, and his Ph.D. in Forest Policy (with distinction) in Wildland Resource Science from the University of California-Berkeley. He is professor of Forest and Environmental Policy in the Department of Forest Science and a former department head at Texas A&M University. He joined Texas A&M after serving as an assistant and associate professor of Forest Policy at the University of Wisconsin-Madison. He is co-founder of the Society for Ecological Restoration and a former member of its board of directors. He also held posts as president, chairman and vice-chairman of several other organization, including the Bay Area Chapter of the Sierra Club and the Southwest Wisconsin Chapter of the Society of America Foresters.

Professor Bonnicksen served four years on the California State Park and Recreation Commission and wrote the legislation that guides the classification and management of California's state park system. He also is a former National Park Service ranger. He has served as expert witness, and presented invited testimony on resource issues before state legislative committees, county governments and several committees of

the US House of Representatives and the US Senate. He has received awards from IM, the National Park Service, the California Resources Agency and the University of California-Berkeley.

Professor Bonnicksen has published 87 scientific and technical papers, articles, book chapters and other publications, and 6 computer programs. He served as guest editor and member of the editorial boards of several scientific journals, and his is currently an associate editor for Restoration Ecology. His research and consultancies over the last 24 years have focused on forest restoration and computer-aided group decision-making to resolve environmental issues.

Jim L. Bowyer, Ph.D., Director, Forest Products Management Development Institute, Department of Wood and Paper Science, University of Minnesota, St. Paul, MN

Dr. Jim L. Bowyer is a specialist in life cycle environmental analysis of materials and global raw material trends. He previously served as Head of the U of M Department of Wood and Paper Science. Dr. Bowyer received a B.S. degree in Forestry from Oklahoma State University, a M.S. degree in Forest Products from Michigan State University, and a Ph.D. in Wood Science and Technology from the University of Minnesota. He has served as President of the Forest Products Society, President of the Society of Wood Science and Technology, and is a Fellow of the International Academy of Wood Science.

Dr. Bowyer is chairman of the steering committee of the Consortium for Research on Renewable Industrial Materials, a member of the Board of Directors of the Tropical Forest Foundation, and a member of the Scientific Advisory Board of the Temperate Forest Foundation. He also serves on the Rocky Mountain Institute Systems Group on Forests.

Dr. Bowyer has authored over 100 articles dealing with various aspects of forest products production and use, and is co-author of the leading introductory wood science textbook in North America. He is a frequent speaker on these and related topics ,and on the subject of environmental aspects of forestry, timber harvest, and wood use.

Frederick W. Cubbage, Ph.D., Professor and Head, Department of Forestry, North Carolina State University, Raleigh, NC

Professor Cubbage earned his B.S. in Forestry from Iowa State University, M.S. in Forest Policy and Ph.D. in Forest Economics from the University of Minnesota. In addition to heading the Department of Forestry, he performs research and teaches course work in forest policy and timber supply issues.

Professor Cubbage was project leader of the forest economics research work unit, Southeastern Forest Experiment Station, and assistant, associate and full professor at the University of Georgia School of Forest

Resources. Prior to that he served as associate economist with the Southern Forest Experiment Station in New Orleans, and as a Service Forester in Kentucky.

Professor Cubbage has authored or co-authored about 200 publications on subjects that include forest policies and program evaluations, regulation of private forest landowners, timber supply modeling, and timber production and harvesting. He is senior author of the 1993 textbook, Forest Resource Policy, published by John Wiley. He has served as an officer in several research organizations, including the Society of American Foresters and the International Union of Forestry Research Organizations. he has been recognized in Who's Who in Science and Engineering and in Who's Who in the Southeast and Southwest.

Chadwick D. Oliver, Ph.D., Professor, silviculture/Ecology, College of Forest Resources, University of Washington, Seattle, WA

Professor Oliver earned his B.S. in Forestry at the University of the South, Sewanee, Tennessee, his M.F.S. and Ph.D. (in Silviculture) at Yale University School of Forestry and Environmental Studies, New Haven, CT. Prior to receiving his Ph.D., he was a Research Fellow at The Harvard Forest, Harvard University at Petersham, MA, and an instructor in Biology at Harvard University in Cambridge, MA.

Professor Oliver's research during the 1970s and 1980s focused on the basic understanding of how forests developed and how silviculture could be applied to ecological systems most effectively. Much of this work is incorporated in a book he wrote entitled Forest Stand Dynamics (1990, and update edition in 96) with former student as co-author. he has continued this work; during the past decade he has also examined how this understanding can help resolve scientific, technical, and management issues at the landscape and policy levels. He is currently working on landscape approaches to management and is involved in the technical tools, the policies, the management approaches, and the educational needs.

Professor Oliver was a member of the Science Panel at President Clifton's Forest Conference in 1993, has testified at United States Senate and House of Representatives Committee hearings, and has served on various scientific panels for the United States and Washington State executive and legislative branches of government.

Professor Oliver is the author of more than 75 scientific and technical papers on forest science subjects and has considerable experience advising public and private natural resource organizations I the United States and abroad. His work has taken him to all parts of the United States and to Canada Mexico, Turkey, Nepal, Japan, Sweden, Finland, Russia, Ecuador, Germany, and France.

Neil Sampson, MPA, Senior Fellow, American Forests, Washington, DC

Neil Sampson holds degrees from Harvard University and University of Idaho. He became a Senior Fellow with the Forest Policy Center after serving 11 years as the executive vice president of American Forests (formerly American Forestry Association). Prior to that, he served 6 years as executive vice president of the National Association of Conservation Districts and 16 years in a variety of positions with the USDA Soil Conservation Service (now National Resources Conservation Service) in Washington, DC and Idaho.

Mr. Samson's research and writing covers a wide range of natural resource topics, with hundreds of articles and book chapters in popular and scientific literature. He has written two books on soil conservation, and co-edited several books on natural resource topics. He is member of the Society of American Foresters and the Soil and Water Conservation Society, where he holds the degree of Fellow, and has been awarded that Society's highest honor--the Hugh Hammnond Bennett Award.

In addition to his work with the Forest Policy Center, he is president of the Sampson group, Inc., an Alexandria, Virginia consulting firm that specializes in helping clients identify common-sense solutions to natural resource challenges.

Scott E. Schlarbaum, Ph.D., Associate Professor, Forest Genetics, Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN

Professor Schlarbaum earned his B.S. and Ph.D. degrees at the Colorado State University and his M.S. at the University of Nebraska. He is currently project leader of the University of Tennessee's Tree Improvement Program. He conducts research on breeding and testing methodologies with recent advances in clonal propagation, and biological control of exotic pests through breeding for genetic resistance. he was a postdoctoral research associate in the Department of Plant Pathology, Kansas State University previously.

Professor Schlarbaum has authored numerous articles in forest genetics, tree cytogenetics and tissue culture. He is currently an associate editor for Forest Genetics, leader of the IUFRO (International Union of Forestry Research Organizations) Cytogenetics Working Party, and serves on the Southern Forest Tree Improvement Committee and the USDA Crop Germplasm Advisory Committee for Woody Landscape Plants.

Professor Schlarbaum is a frequent speaker on exotic pest issues. He has advised the USDA-APHIS (Agricultural Pest and Health Inspection Service) on exotic pest issues and policies. He has published articles on the exotic pest problem in North America, the most prominent being a co-authored report entitled, "Fading Forests. North American trees and the threat of exotic pests" a Natural Resources Defense Council report.

Ross S. Whaley, Ph.D., President, SUNY - Environmental Science and Forestry, Syracuse, NY

Dr. Whaley served 6 years as chief economist for the USDA Forest Service and served in academic and administrative positions at the University of Massachusetts, Colorado State University and Utah State University. Dr. Whaley is a Fellow of the Society of American Foresters and served as its president in 1991. He also served on the Boards of the Pinchot Institute of Conservation Studies, the Au Sable Institute of Environmental Studies, and the Nature Conservancy.

Dr. Whaley has served on several gubernatorial commissions in the state of New York, including the Task Force on Forest Industry, Adirondack Commission, and Northern Forest Lands Task Force. Dr. Whaley's professional interests lie in the political economy of forest resource use and conservation.

Harry V. Wiant, Jr., President, Society of American Foresters, Morgantown, WV

Dr. Wiant retired in 196 from the faculty of West Virginia University, Division of Forestry. He earned his B.S. in Forest management at West Virginia University, M.F. in Silviculture, University of Georgia, and his Ph.D. in Forest Ecology from Yale University. He served on the faculty at the Stephen F. Austin State University and Humboldt State University. Prior t that he was a forester for the USDA Forest Service.

Dr. Wiant has received awards from West Virginia University and Humboldt State University, served as editor of Northern Journal of Applied Forestry and West Virginia Forestry Notes. He is registered professional forester in West Virginia, a certified SAF Forester, and has served on the West Virginia State Board of Registration for Foresters.

Dr. Wiant has served as chair or officer of the Society of American Foresters t the national level, Allegheny and Lufkin-Nacogdoches section and at the WVU chapter. He has authored 200 scientific publications and two books.

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